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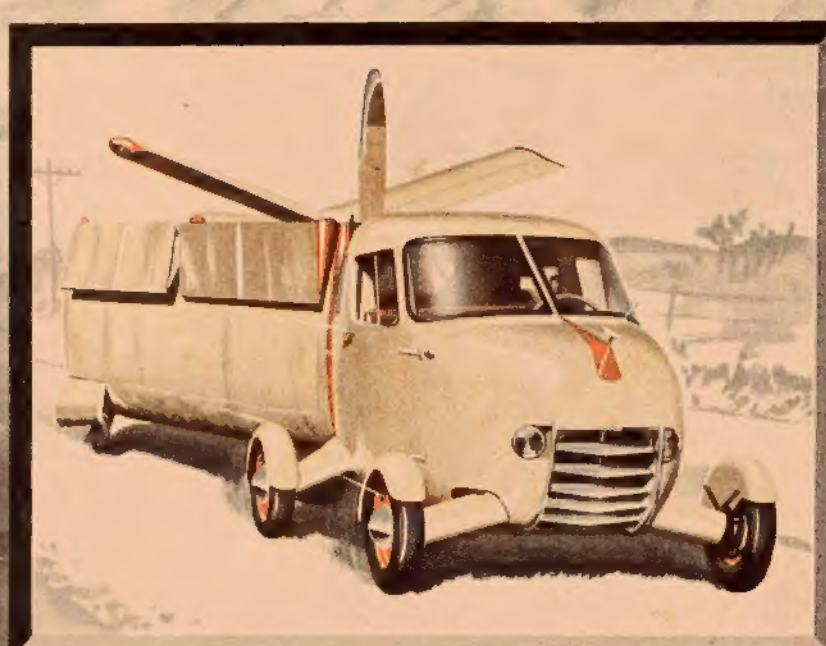

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AIR TRAILS
The Leading Magazine of Air Progress and Aeromodeling
May, 1951

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THE READERS WRITE:

All Communications to the Air Trails editorial offices should be addressed to Air Trails, 304 E. 45th St., New York 17, N. Y.

Says "Air Force Fighter Is Best!" . . . I should like to comment on the article appearing in your March 1951 issue entitled "The Navy Fighter Is Best!" In the following letter I will try to show why I think "The Air Force Fighter Is Best!" I am not writing out of any partiality to the Air Force but merely to give the other side of a two-sided story.

The Deputy Chief of Naval Operations for Air, Vice Admiral Cassady, said recently that the Russian Mi-1 (MiG-15) was superior to every operational American fighter except the F-86 Sabre. This means the top-ranking Naval airman considers the Air Force's Sabre better than anything the Navy has in service. To show why I think Admiral Cassady is correct I should like to question the author's statement that speed is not of primary importance in an interceptor.

To shoot down a bomber an interceptor must not only catch it but must have sufficient superiority in speed to make several gunnery runs. Most tactical experts hold that a fighter must have at least a twenty percent speed advantage over a bomber to make interception a reasonable probability. You will remember that World War II interceptors didn't have too easy a job of it even with speed advantages running over one hundred percent. This means that to successfully intercept a modern 650-mile-per-hour bomber, such as the Boeing B-47B, a fighter would have to be able to attain a speed of at least 780 miles per hour.

This fact alone renders all Navy and most Air Force fighters ineffective. The only fighters we have today that could make such an interception are the F-84F, the F-86D and E, the F-90, the F-91, the XF92A and the YF-93A. It is interesting to note that the fastest Navy fighter, the F7U, is rated "in the 650 mph class," while the fastest Air Force job, the F-91, is listed as "over 920 mph." This same Air Force F-91 has, contrary to the author's claims, the quickest take-off, the fastest climb, and the slowest landing speed of any known jet fighter. This performance is due to its variable incidence wing and the tremendous power (one General Electric J-47-A plus after-burner plus four Curtiss rocket units).

I also dispute the statement that Navy fighters are more maneuverable. The standard Navy interceptor, the F9F Panther, has somewhat less useful wing area than the standard Air Force F-86 Sabre, and it carries considerably more weight (17,000 pounds to 13,750). This, coupled with the Sabre's lower power loading, should give the Air Force fighter a definite edge in the powers of maneuver.

Convair and Republic claim that the delta wing on the XF-92A and the inverse taper wing on the XF-91, respectively, make them more maneuverable than anything now flying. Which of these is the most maneuverable is problematical, even though the Convair test pilot on the XF-92A claims his ship will maneuver the pants off anything in the air.

The author's statements on armament are irrelevant as most fighters carry M-3 .50 caliber, .60 caliber, and 20-mm guns interchangeably. However, most fighter pilots, I believe, prefer the .50's to the higher caliber weapons for high altitude work. There are many reasons for this, among them: 50 percent higher fire rate, the ability to carry six instead of four guns, the fact that the explosive force of the 20-mm shell definitely leaves something to be desired, and the fact that in the rarified upper air the .50's effective range compares favorably with that of the heavier guns. However, the larger guns are, for the most part, preferred for low and medium altitude fighting.

In summing up I would like to say that there are few Naval fighters that could even catch a modern bomber, to say nothing of shooting it down, and that in the F-91 and the XF-92 the United States Air Force has the fastest, quickest climbing, and most maneuverable interceptors in the world. The Air Force Fighter is definitely better.

William R. Corliss, The W. R. Corliss Aeronautical Collection, Detroit, Mich.

To Contact Aerobatic Champ . . . Could you send me address of Rodney Jocelyn, National Aerobatic Champ? What color was his Great Lake trainer?

Lawrence Shaw, Orillia, Ont., Can.

● Rodney Jocelyn may be reached at the Old Star Airport, Langhorne, Pa. His airplane is painted red and cream.

Readin', Writin' & Air Trails . . . I am 11 years old, but I've been reading your book for a year and a half. When I take my new copy of Air Trails to school with me all the boys in the room want to read it.

David Moore, Memphis, Tenn.

Engine Conversion for Racing . . . Can you tell me of any aircraft engine book that illustrates the re-building of the small 4-cyl. opposed engines into hot-rod racing engines? We want to re-build an engine for our Knight Twister that was designed by V. W. Payne.

B. E. Ladd, Stockton, Calif.

● Sorry, there is no book on conversion of a four-cylinder plane engine for racing. However, the 190-cubic-inch Continental C-85 is being used successfully for midget plane racing with racing McCauley or Sensenick props. It puts out over 100 mph at 3,250 rpm. We suggest you write to Continental Aviation and Engineering Corporation, Muskegon, Mich., for information on conversion of the engine to obtain higher power.

Correction by Navy Man . . . Ordinarily I don't write editors about typographical errors, and more than likely many others will "sound off" at the same one I found.

In the February Dope Can, the little "barrel-bellied" fighter in the lower right-hand corner is an F2F-1, not an FSF-1 as printed. To my knowledge, Grumman never put out a plane with such a designation, for according to Navy classification, FSF would mean fighter-scout by Grumman. Right or wrong?

I'm not a model builder but a model railroader, but am a regular reader of your mag for possible construction hints that will be useful to me. It's a good mag.

Joe C. Rebik, ATC, USN

● You're right, we're wrong. That stubby Grumman biplane fighter is an F2F-1. However, you're wrong in stating that there never was an FSF-1. The FSF-1 was a two-place scout-fighter by Grumman.

Those Designation Circles . . . Reading your article called "The United Nations Air Force," I started going in circles. Labeled as a B-26 you have what I always thought to be a Douglas A-25 attack bomber. I checked up and found the Martin Marauder listed as the B-26 and the other plane as the Douglas A-25 Invader. This confused me too as I thought the Invader was the A-36 attack version of the F-51A. I found this to be true also. Could you please straighten me out on this?

I would also like to know if the Focke-Wulf FW 200's and the 198's were used much, and if they were successful. What was the armament of the FW 200? What happened to the Hawker Typhoon?

Kenneth Hands, Ellicott City, Md.

World War II B-26

Current USAF B-26

● You are completely mixed up in your designations. The Invader was formerly called the Douglas A-26. When the Martin Marauder went out of service after the war, the Invader was redesignated as B-26. The A-25 was the Curtiss SB2C used by the Air Force. The North American A-36 was used for a short time by the British. It was similar to the F-51A but equipped with spoiler type dive brakes.

There was no such airplane as the FW 198. The FW 200 was employed on Atlantic patrol to spot convoys and relay information to Nazi submarines. The Hawker Typhoon just became obsolete and was replaced by more modern fighters.

(*Continued on page 9*)

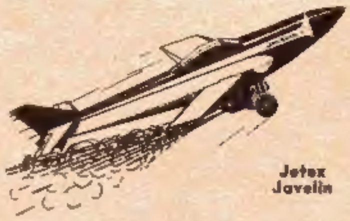
Showcase

Contact your hobby shop for items shown. All information is checked carefully, but is subject to change.

A deluxe *Mustang* is Berkeley Model's P-51 kit which makes up into a 1 inch to the foot controliner for engines from .19 to .35 cu. in. disp. Spanning 37 inches, the $5.95 kit contains die-cut balsa and plywood parts, formed landing gear, celluloid bubble canopy, U.S. decals, wheels, complete hardware, covering material for the planked fuselage. Kit incorporates a landing gear which may be retracted or extended at will, including the tail wheel. Automatic flaps, engine throttle control as well as elevator and "Autotrol" rudder operation make this laminar-flow airfoiled fighter model something apart from the standard scale control line job. A specially machined four-notched aluminum spinner is included . . . . As a departure from their usual line of aircraft models, Sterling Models have come up with two boat kits that are worthy of your attention. Boats make up into attractive mantel display pieces or can be powered by a small engine. All that's needed in addition to the kits are an engine, flywheel, cement and paint. Kit B-1 is the *Richardson "27" Sedan Cruiser* and sells for $5.95; the Kit B-2 is the *Higgins "17" Sport Speedster* and is priced at $4.95. The lower portion of each hull is carved and slotted for the necessary bulkhead; it is drilled out for the stuffing box. Mahogany parts are all die cut and faithfully duplicate the prototype . . . . American Telasco, Ltd. has introduced the *Jetex Javelin* for its Jetex #50 jet engine. The price is a modest 75¢; stressed skin construction. One of the few models especially designed for Jetex power. (*Continued on page* 10)

Berkeley's Mustang

Sterling Boat



Jetex Javelin

The Readers Write

(Continued from page 4)

To Contact ULAA . . . It was a pleasant surprise to learn about ultra light flying. Mr. Colby's excellent article, "The Ultra Lights of England" made me feel there is still some hope for those of us unable to afford "light" plane flying.

I for one agree with the sort of program the Ultra Light Aircraft Association is carrying out. Perhaps it would be doing a favor for many if you would publish the address of the organization.

John D. Goddard, Toronto, Ont., Can.

• Communications should be addressed to The Hon. Secretary, U.L.A.A., 15, Westbourne Park Road, Bayswater, London W.2, England.

More Figures on Gee Bee . . . In Jim Belknap's letter concerning the Gee Bee racer No. 4, license No. NR77V, flown by the late Lowell Bayles, the author states this plane averaged 267.342 mph in the 1931 Thompson Trophy. This is not correct. The average speed was 236.239 mph.

Bayles' average *qualifying* speed (which in those days was determined at the Shell Speed dashes) was 267.342 mph, his fastest pass being about 269.(???) mph. Late in Nov. 1931, Bayles took up the plane, refitted with a heavier engine, in an attempt to break the land speed record which then was about 278 mph. The attempt was made at the Wayne County Airport near Detroit, and he made an unofficial record of 307 mph. But something went wrong with his timing devices and it did not enter the record books.

Bayles did not give up, however, so on Dec. 5, 1931, he dove for the 1.8 measured mile, at an altitude of less than 200 feet, at the speed of 325 mph, when the "City of Springfield" seemed suddenly to explode. As for this being the plane that held the American speed record of 280 mph, this is not true. . . . The fastest clocked time of the 1931 Gee Bee was 281.754 mph, which was not enough to set a new record under the F.A.I. rules. This speed being time during the runs at Detroit, not Cleveland.

Mr. Belknap is also incorrect in saying this was the fastest plane of its time. The truth is it was probably the fastest land racing plane of its age, but the fastest plane of that era was the S6-B Supermarine Race (Seaplane) which set an average speed of 408.8 mph on Sept. 29, 1931, at Calshot, Great Britain. Fastest recorded lap was 415.2 mph.

I may be off a few hundredths of an mph, as I know the inaccuracy of reporting times by some of our better newspaper and magazine authors. I have a file with every article, picture and newspaper clipping it has been possible for me to obtain from all over the country, so I believe my figures and dates will stand up.

Carl H. Boas, Reading, Pa.

• We have checked with the Aviation Chronicle and your information jibes with it. However, the point that Mr. Belknap wanted to make was that the Gee Bee was faster than the Hawker Super Fury. Our contention was that the Gee Bee was a specialized aircraft built for racing and speed dashes, while the Super Fury was a standard service machine and as such was the fastest in the world in its class at that time.

Bill Barnes Inspired Career . . . On reading a recent issue of your super magazine I was very pleasantly surprised to see that you folks hadn't forgotten Bill Barnes. I suppose if we analyzed my past, Bill Barnes had as much influence on my life's work as any one thing.

As a boy I ate, slept and dreamed Bill Barnes and drove my teachers nuts drawing airplanes that always looked like his. I am now with National Airlines but as of March 1, I will again be working for my favorite uncle, the U.S. Air Force. (And I received first place in your Airmen of Vision design contest in December issue).

It seems to me that in this day and time, with the terrific advances of the aircraft industry, that a return of Bill Barnes to the pages of your magazine would provide our air-minded youth a far more educational and exciting hero than the fantastic comic books on the stands today.

J. W. McConnell, Miami, Fla.

Can B-17 Land Sans Tail? . . . It is imperative that a hot argument be settled by you. A friend of mine insists he saw a picture of a B-17 with the complete tail assembly shot off that had landed successfully after completing a mission. I claim it is impossible for any type of airplane to even glide for a minute that way, unless it is designed to do so, such as the Northrop Flying Wing.

I am a modeler and a subscriber to Air Trails. In fact my first model was an old twin pusher. I started building when contest rubber-powered free flights were known as "commercials." Presently I am doing some experimental model radio-control flying.

I spent three years in the Air Force and flew B-17s. Nevertheless my friend, who was an infantryman and knows nothing of aerodynamics, sticks by his story. In fact, every time I see him he kids me about the B-17 (tailless).

Oscar Stern, Brooklyn, N. Y.

• Many claims have been made of shot-up aircraft landing safely, but we never heard of the one mentioned. Even if you eliminate the aerodynamic aspect of a completely tailless B-17 making a landing, the shift in the C.G. itself would cause the plane to dive at a sharp angle, from which recovery would be impossible even by applying full power to all engines.

There was a case in England wherein a B-17 was so badly damaged by gunfire that the entire rear section of the fuselage just behind the crew door fell off the moment the ship touched down—but this did not happen until the landing impact broke it off. Perhaps your friend saw this photograph and drew a wrong conclusion.

Movie Trainers . . . I have just seen "Keep 'Em Flying" with Abbott and Costello and would like some info on the PT bipes used in the picture.

Robert Zubowski, Pittsburgh, Pa.

• The biplane trainers in this movie were Stearman PT-17s powered by 220 hp radial engines. These were standard primary trainers used in World War II.

Showcase

Try your favorite hobby shop for items presented here. Write the manufacturer if you can't find it.

One of the most significant models to enter the Jim Walker line (A-J Aircraft Co.) was his small *Firebaby* which comes ready to fly without a Half-A motor for $2.50. *Now* Jim has the little *Firebaby* complete with motor for $7.50 and that should be good news to lots of model enthusiasts. Jim reports you can now buy it ready to fly, complete with flying lines, "slow motion" prop and full instructions for flying and stunting. Wing span is 19 inches, weight with motor, 3 ounces. All parts are finished, painted, fuel-proofed. You just slip them together, bolt on wing and motor, "gas up" and you're ready to take off . . . . Fador Mfg. Co. announces all its *Smallster* auto kits are now coming through with realistically detailed, true-to-scale plastic parts; this speeds up construction and assures a first class job . . . . Enterprise Model Aircraft & Supply Co. has introduced a new line of prefabricated solid models known as the *Combat Aces.* Series includes the F-51 Mustang, F-84 Thunderjet, F-80 Shooting Star, F-86 Sabre, F9F Panther and the Russian MiG-15 jet. Models average about 13 inches in wingspan and are of all-balsa construction. Each fuselage is fully carved ready for sanding; formed bubble canopies, die-cast propellers and wing bombs where called for; die-cast pilots and nose sections. Plastic fittings as well as complete authentic decals are included. Each is priced at $2.50 . . . . Have you seen the 1910 *Curtiss Pusher* by Model Plastic Products? This one is really cute. Span is 8½ inches and the model is to ¼" scale. Complete, prefabbed. $1.25.

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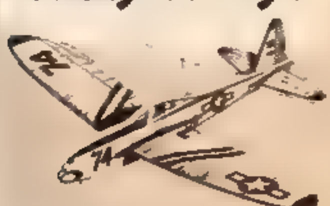

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Jim Walker FIREBABY

Buy it ready to fly, complete with flying lines and full instructions for flying and stunting. Wing span is 19", weight with motor, 3 oz. All parts are finished, painted, fuelproofed. Just slip them together, bolt on wing and motor, "gas up" and you're ready to take off! Without motor . . . **$2.50**

$7.50 with motor

Jim Walker **A-J AIRCRAFT CO.**

1166 N. E. 31st Ave. Portland 12, Oregon

air notes

Herculean Effort. It takes a lot of power to start a jet engine. The electric starter which spins the jet into life develops 16 hp and weighs 61 lbs. Compare this to the 5 hp starter that is needed to fire up the largest reciprocating engine, the Pratt & Whitney 28 cylinder Wasp Major of 3500 hp. In addition, the generator cart which supplies juice to the jet starter weighs over 1000 lbs. For self-contained starting system, a 150-lb. battery must be carried in the airplane, which when fully charged provides sufficient energy to crank the starter for three minutes. Lighter starting devices using air turbine and explosive cartridge are now under development, all of which will save considerable weight and offer dependable self-contained power source.

More Power for C-119. 1952 production models of Fairchild C-119 Packets will be powered by the Wright 18 cylinder R-3350 compound engines developed from basic R-3350 2,200 hp powerplant by the Wright Aeronautical Corp. These will provide 3,250 hp by feeding exhaust gases into three turbines. Energy developed by the turbines is then transmitted to the crankshaft by means of fluid coupling. With water injection, the take-off rating of engine is raised to 3500 hp. The new powerplant, while developing same power as the Pratt & Whitney R-4360 Wasp Major, now used in the C-119, consumes less fuel and, therefore, gives more range with the same gas load.

Air Conditioning the Jet Pilot. At 600 mph the cockpit temperature of a jet fighter can rise to 190° F. If the airplane is not equipped with air conditioning, 50% of the heat is generated by the friction of the airplane's skin with the air, 40% by radiation of the sun, 5% by the electrical equipment and 5% by the body heat of the pilot. To keep the pilot cool and comfortable all present day jet planes are equipped with an air conditioning system. How small and efficient this device is was recently disclosed by the Hamilton Standard Propeller Co. which manufactures such units for the Lockheed F-94C all-weather two-place fighter. The little device weighs only 26 lbs., and could make 22,500 lbs. of ice cubes a day or air condition two seven-room ranch houses. But, warns Hamilton Standard, don't rush to buy one for the new home. You will need a jet engine (cost $50,000 to $100,000) to run it.

Turbo-Prop Globemasters. The U. S. Air Force has awarded a contract to Douglas Aircraft Co. for a turbo-prop version of the giant C-124 Globemaster cargo transport. Designated as the YC-124B; the new plane will be powered by four Pratt & Whitney YT-34-P-1 turbo-prop engines each developing 5,500 hp. First flight for the airplane is scheduled for the spring of 1952.

Long Flight. A Convair RB-36D reconnaissance bomber flew for 51 hours, 20 minutes without landing during a recent test flight conducted at Fort Worth, Texas.

Para-Container. An entire infantry squad may be dropped, one of these days, in a container developed by the Air Materiel Command at Wright Patterson AFB. The Universal Container, as the device is called, weighs 6000 lbs. and can be dropped from a Fairchild C-119 Packet. A single 100 foot chute is used for loads up to 3500 lbs., two 100 foot chutes for loads up to 6000 lbs. Four large air bags shaped like a barrel cushion the landing impact. Besides infantry, the container can be used to drop a complete weather station, airplane equipment, rescue station and survival hut for Arctic use.

Navigation Trainers. A fleet of 16 Convair T-29 (Convair-Liners in civilian life) are being used to train navigators at Ellington AFB, near Houston, Texas.

Flying Test Beds. In order to speed up the development of advanced type jet and turbo-prop engines, Pratt & Whitney Aircraft is using three war-weary Boeing bombers, each powered by four piston engines and fitted with a fifth experimental jet. These flying test beds are: a B-17, equipped with a T-34 turbo-prop, a B-29 on loan from the Navy which carries the 6250 lb thrust P & W J-48 jet engine in its bomb-bay, and a B-50 which presently is being modified to carry an even more powerful jet in a pod nacelle suspended under its belly. The B-50 is on loan from the U. S. Air Force. The main function of these test beds is to get a new engine into the air at an early development stage in order to discover and correct any operational weaknesses before production begins.

Protective Clothing. Working with liquid rocket fuels is a risky job. Some of them, such as red fuming nitric acid and aniline are highly toxic. Aniline is often odorless and colorless, and is readily absorbed through the skin. It is deadly if enough of it enters the blood stream. In order to protect the men who work with these liquids, Air Materiel Command, Wright Patterson AFB has developed special clothing consisting of coveralls and hood fabricated from vinyl impregnated fiberglas, butyl rubber boots and vinyl coated cotton gloves. A plastic visor in the hood gives wearer ample front and side visibility.

Baby Turbine. The Boeing lightweight gas turbine, developing around 175 hp, has been undergoing for several months operational tests as a powerplant of a large trailer truck. Another one powers a Navy personnel boat. So satisfactory were the results of these tests that the Navy's Bureau of Ships has given Boeing a contract for a number of them.

Look, No Hands. An automatic pilot which permits "hands off" flying of helicopters has been recently developed by the Aeronautical Instrument Lab of the Naval Experimental Station at the Philadelphia Naval Base. With this device, the flying windmill can hover or go in almost any desired direction just by the twist of a knob.

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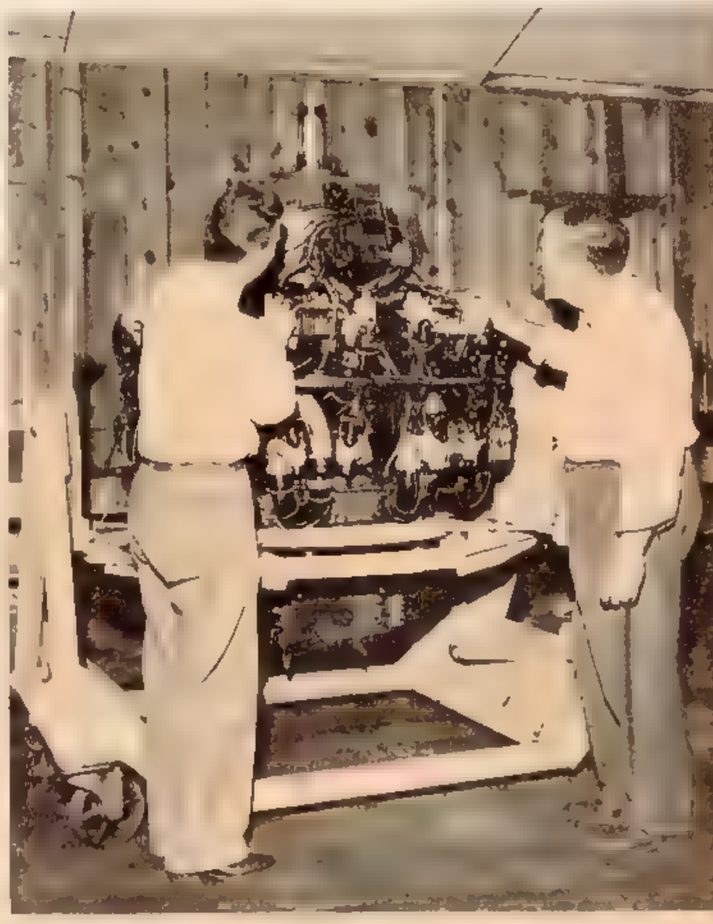

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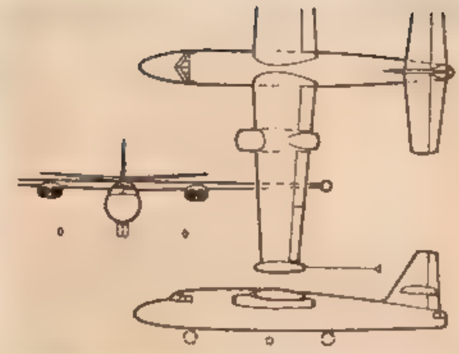
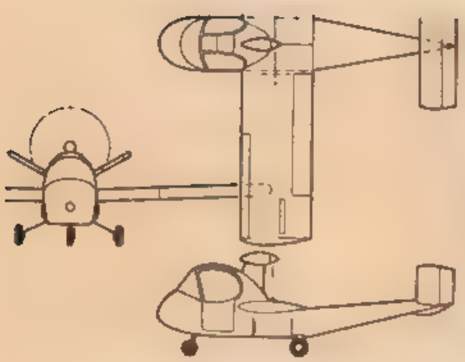
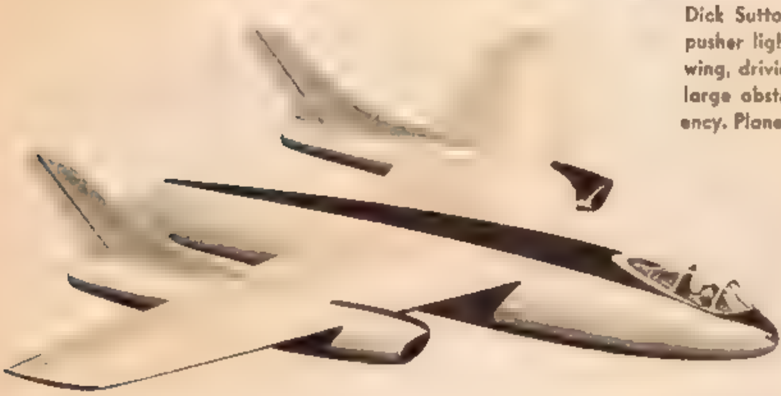
Airmen of Vision
DESIGN COMPETITION

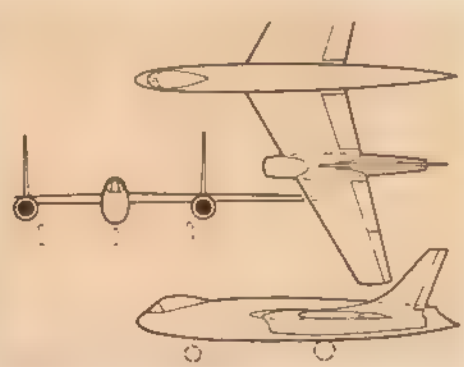


Here's a first-class idea by Warren Pollington of Inglewood, Calif.—a jet-powered tanker for air-to-air refueling. Fuel is carried in hollow box spars of wings, with additional tanks in fuselage. Refueling equipment housed in wingtips. Plane is designed to refuel two jet fighters at same time. Another hose in tail supplies gas for a bomber. Refueling operations are controlled from tail.



Dick Sutton of Lawrence, Kans., submits a design for an unusual pusher lightplane in which engine is located in fuselage, below the wing, driving an overhead propeller through extension shaft. Lack of large obstruction, such as an engine, greatly increases prop efficiency. Plane has crosswind landing gear. Spoilers supply rolling action.



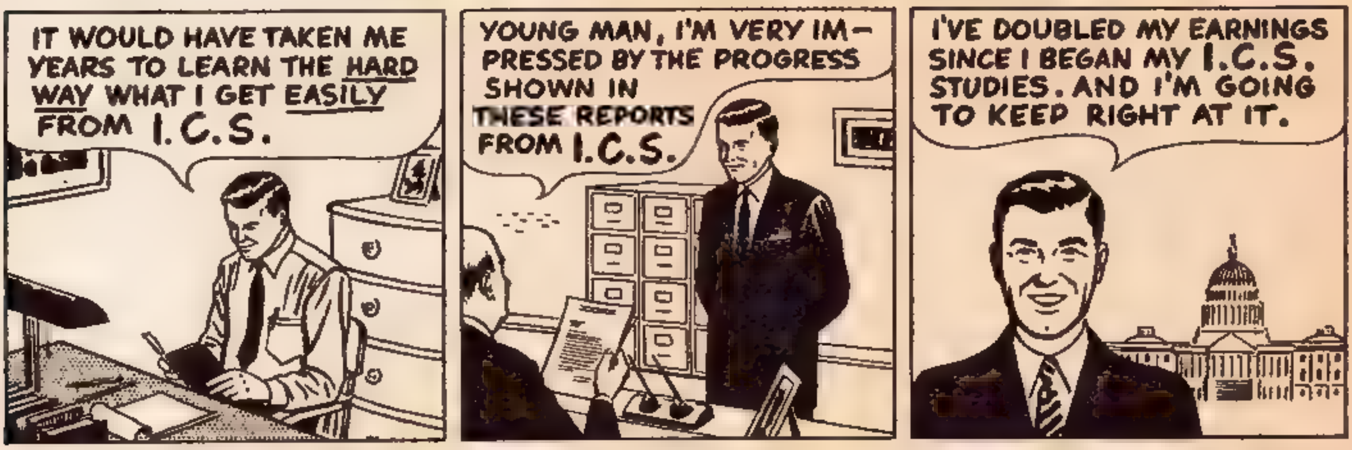


The Rattler, a high-speed twin jet interceptor by Robert R. Bruton of Fort Worth, Tex. Forward location of cockpit gives pilot excellent visibility. The two turbo-jet powerplants supply 5,200 lbs. of thrust each. Plane is capable of speeds between 750 and 800 mph. Landing gear is bicycle with auxiliary wheels carried in engine nacelles. Wing span 48 ft., length 36 ft. Armament consists of four 20-mm cannon.

Air Trails has opened its columns to those who are interested in presenting plans for "aircraft of the future." Rules governing the competition are as follows: Three-view sketches of the proposed aircraft will be required. These should be not less than 8½ x 11 inches for the entire three-views. Give sketches of the complete airplane in three-quarter front and rear positions. Photos of a model of proposed design may be included. Information on power plant(s), estimated performance, dimensions, and explanations of any unusual features are required. Data as to age, occupation or schooling of the entrant will be welcomed by the editors and judges. The designs may be of any type: commercial aircraft, military planes (fighters, bombers, troop transports), planes for the private flyer and single-engine sporting or racing craft. The entry each month judged the most practical or of the greatest significance will receive an award of $25. Payments of $5 will go to the runners-up. Entries will not be returned and for that reason those participating should keep copies of all material submitted. Mail entries to Airmen of Vision, c/o Air Trails, 304 E. 45th St., New York 17, N. Y. Editors regret that because of large number of entries they cannot enter into correspondence on A. of V.

A TRUE I. C. S. STORY *taken from an actual letter*

I was a World War II pilot . . . | A prisoner of war in Germany . . . | Back home, I was hired by National . . .



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Air Mobilization

By KENDALL K. HOYT

■ These are the months in which the strain of war manpower mobilization will be no longer just talk and reading matter but will be felt more and more in every area.

How many must go and for how long a period? These are unanswered questions as the services count their needs and their present resources.

Air Force Reservists are being called to a few days of active duty so they can be examined physically and screened as to essential workers and hardship cases to be deferred. Most of the enlisted men and many of the officers will be recalled to active duty.

The opportunities for others who wish to join the air services remain as reported in last month's series of reports

For those who decide not to volunteer at this time, the Generals and Admirals tell you to *stay in school*. Learn as much as you can.

There is much to be learned and service to be rendered also in the fast developing program of civil defense

Air spotters are being organized Officials realize that a great weakness thus far is in *aircraft recognition* which airplane model builders in every area can well remedy. But first about the set-up. . . .

Bear in mind that the purpose is to protect against sneak attack by enemies who might find holes in the radar fence. The main areas to be guarded are the industrial Northeast, the Pacific Northwest, and California to the Southwest, where aircraft plants are so heavily concentrated

Other areas, such as the Oak Ridge atomic energy plant, require special precautions not for volunteers but for full-time federal employes on constant ground patrol by horse, jeep, and on foot.

Elsewhere, the system must rely on thousands of unpaid civilians, patiently watching from towers or hills in the danger periods. The job is for the Air Force

Formerly under the Continental Air Command, the Air Defense Command is now on its own, operating through the Eastern and Western Air Defense Forces and the newly organized Central Air Defense Force. These Forces tell the States where spotter nests should be located. The State and local civil defense organizations will work with the Air Force in recruiting enough volunteers.

Present plans call for organizing spotters in 36 States. In 25, heads of most of the spotter stations have been chosen. The program has begun more recently in the other 11. The watch will be kept around the coasts and the northern border, to guard the approaches from Red territory, and not (as now planned) the central area. (See map.)

Spotters are now on a standby basis, at their posts only when called for a practice alert. But would they know an enemy plane if they saw it? (*Cont'd on page* 78)

Here are the thirty-six states, or sections of states in which air spotters are already organized or in the process of getting ready for "business." Contact your CD office for info.


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Russia—Colossus of the Air PART 1

Most comprehensive, startling report yet: training, jet progress, operation, naval arm and all phases

By "ARGUS"

■ The paralyzing uncertainty that is dominating the Western World is a fire fed by concern over the awe-inspiring air potential of the Soviet Union. Russia looms as a greater menace to their security than the countries participating in the North Atlantic Alliance have ever had to face. Few Western Europeans or North Americans now ignore this fact, and most realize that some drastic action must be taken to counteract the threat of barbaric invasion and slavery. The whole Soviet empire is organizing as a single entity to maintain the greatest military forces ever assembled by one government, and of these, the Soviet Air Force is perhaps the most vital part.

Every indication is that the majority of Russian air formations are still tied to the Red Army and are, in fact, an integral part of the steamroller ground forces. If the West can blunt Soviet air power, it also slows the advance of the Red armored divisions and, incidentally, lessens the risk of Russian domination of the seas. Great importance therefore attaches to a correct appreciation of the strength, role and final effectiveness of Russia's air arm, so that the Western World may forge an air weapon which will neutralize and later destroy completely the last vestiges of the Red air armada.

During the years of World War II, main Russian productive effort was concentrated on vast manufacture of strictly orthodox aviation equipment. Aircraft types were functional and accent was placed on rapid availability; in some cases production simplicity taking precedence over fullest fighting efficiency. Combat machines were reduced to a few simple types which proved highly efficient for their particular roles but, as the war drew to a close and increasing quantities of the latest Luftwaffe equipment fell into their hands, the Russians had brought home to them with great force how very far behind they were in almost every branch of military aviation science.

In 1945, the Soviet Air Force was a very fourth-rate organization indeed. It has taken the Russians over five years of accelerated research, with a very great deal of German assistance, to make up the leeway.

At the present time the whole equipment position is in a transitional stage. Several excellent jet-propelled types have appeared and been placed in large-scale production after a period of immense

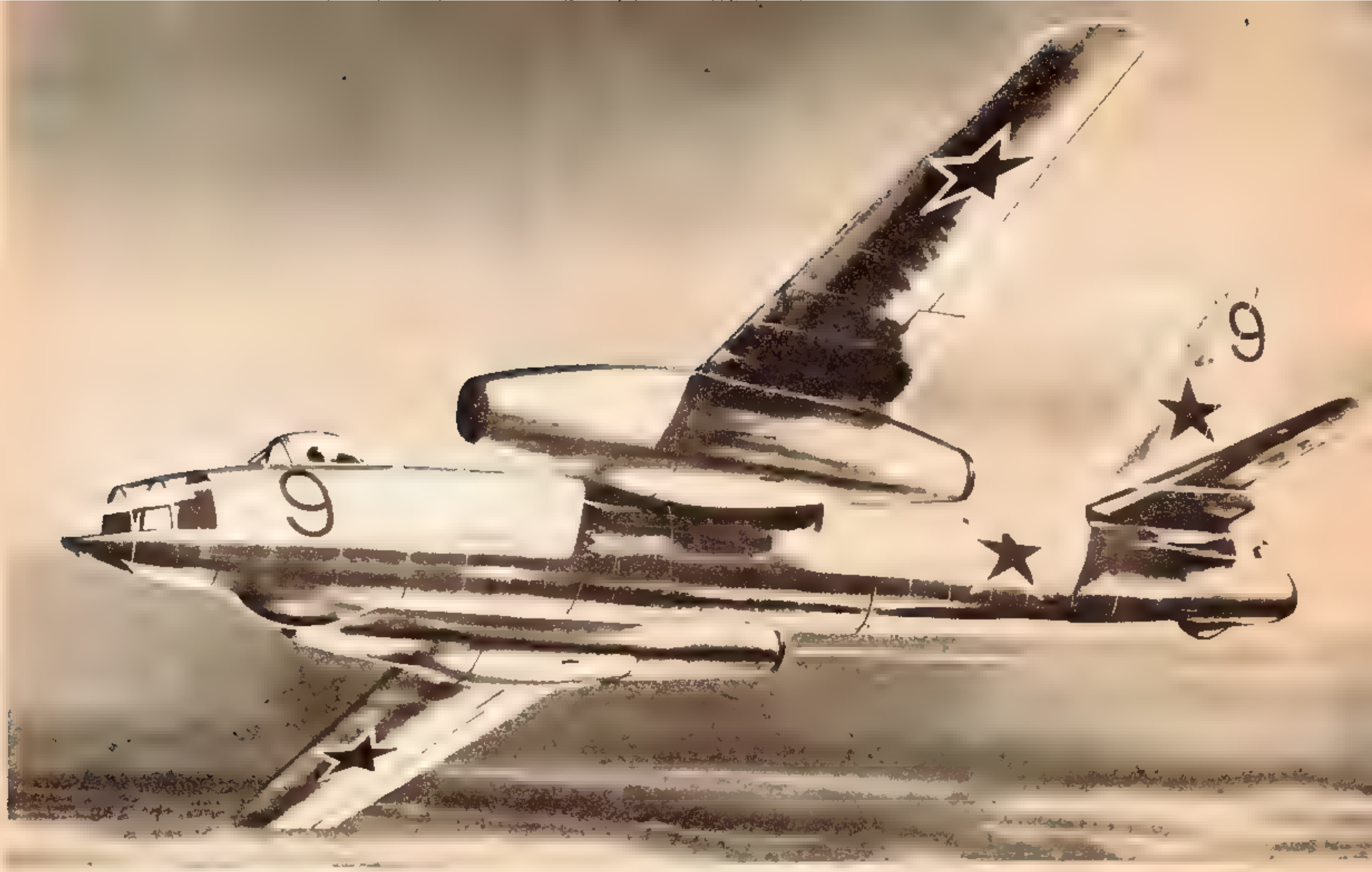
Latest version of YAK-15 is equipped with tricycle gear. Fin and rudder were redesigned. Engine is axial flow M-004, top speed 505 mph.

difficulties with the new jet powerplants, with high-speed aerodynamics, electronics, new tactics and strategic conceptions, and all the other techniques and apparatus developed by other powers during the fertile war years. Latest Red swept-wing fighters and jet bombers in production should acquit themselves well against the best service machines of other nations. On the other hand, a large percentage of air regiments are still equipped with piston-engined types serving at the end of the war, or built since 1945; which matters little to the Russians at the moment as the air forces of the Atlantic Pact countries have nothing to oppose these while engaging the newer types.

Combat strength of the Soviet Air Force, estimated officially as between 15,000 and 20,000 first-line aircraft, is only the centerpiece of a vast structure started long before the last war whereby the whole Soviet sphere of influence is being made air-minded to an unprecedented degree. The foundations of this giant edifice of air power lie in the mass training of aviation industry apprentices, conscripted in their early teens to man the numerous aviation colleges and technical schools. This fund of industrial engineers and minor technicians is drawn from the still larger pool of members of the aviation branch of the DOSAV organization, which gives elementary training in airplane modeling, gliding, powered flying, parachuting, and instruction in the rudiments of aviation science. Thus, personnel are in the process of being bred almost from childhood to man a vast aviation industry.

From DOSAV is also drawn the main stream of recruits for the Soviet Air Force and the Army airborne forces. Lack of suitable manpower is the *last* thing that should worry the Soviet Union in a large-scale clash between East and West. A factor that is more likely to limit the size of the Soviet Air Force is manufacturing capacity for aircraft and allied equipment. Soviet wartime production was far outdistanced by the phenomenal British and American output, but whereas the democraic countries have reduced production to a tiny proportion of wartime capacity, the Soviet Union has increased not only her potential but her *actual* aircraft output compared with wartime figures. Nevertheless, Russia is unlikely to embark upon any war that they think will last long enough to allow Anglo-American productive capacity to attain a wartime footing. The danger is that our numerically inferior forces will be swamped in the first onslaught.

The quality, as distinct from the size, of the Soviet Air Forces is of great, but not overwhelming, significance. Examination of various modern Russian civil aircraft, which occasionally fly out from behind the Iron Curtain, leaves little doubt that the quality of workmanship in Russian airframe factories is not markedly inferior to the average standard set in the West. The main qualitative differences are to be found in engines and miscellaneous aviation equipment.



Believed to be designated TU-10, this twin-jet is tactical bomber. Notable here is the straight, square cut-wing and swept-back tail unit.

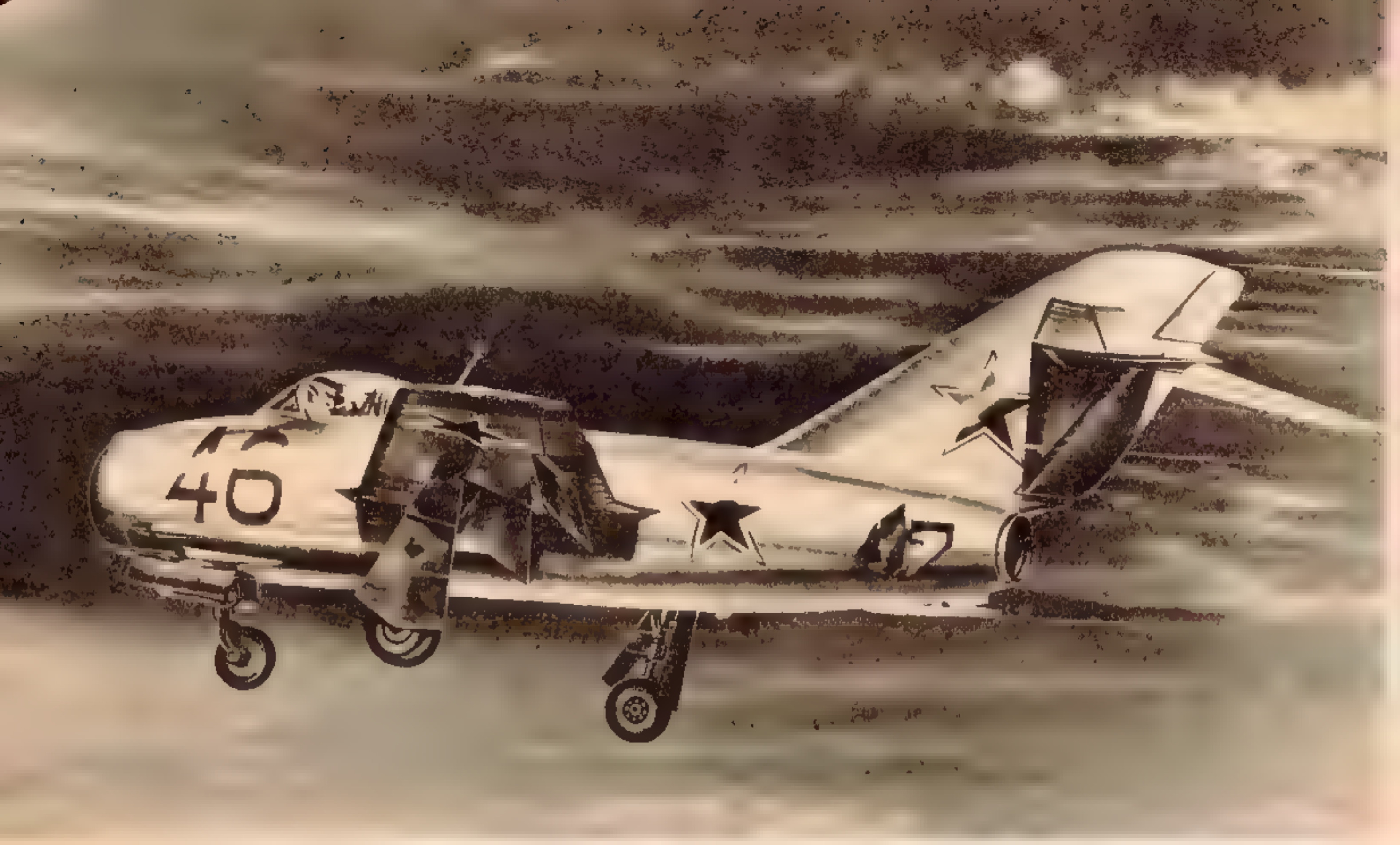
Russian designers have both big advantages and grave disadvantages compared with their counterparts elsewhere. In the first place, where they enjoy the confidence of their political and industrial superiors they can call on every possible assistance with their work, including the use of numerous fine government experimental establishments with full wind tunnel equipment. On the other hand, if they are unlucky enough to initiate any new equipment, theory, or technique which is unsuccessful or is not in accord with official views, they risk a damaged reputation and even loss of liberty. The result is bound to be the constant throttling of originality which, after the war, caused a major crisis in Soviet aviation affairs. Then, German research material and technicians, British and German turbo-jets, had to be acquired with frantic haste in an effort to match the technical superiority held by the other great powers.

Unfortunately, although this tendency toward orthodoxy may continue and, in time, do irreparable damage to Soviet aviation, at the moment the Russians are easy leaders in the intensifying race for air superiority by virtue of their vast numerical strength.

Apart from the top-line designers, the lower ranks of technicians are still sub-standard and under strength; first fruits of the giant government training scheme mentioned earlier being enjoyed, however, as the flow of students from the aviation institutes into the Air Force and industry increases. Important among the numerous technical institutes and colleges is the *Zhukovski Air Engineering Academy,* the ace Soviet research institution and training ground for picked aircraft designers, radio, radar, engine, armament and other specialists. Technicians trained here eventually find their way into top positions in the Soviet Air Force and aviation industry. Other important academies producing key personnel for aviation and allied industries are: the *Moscow Aviation Institute,* the *Aviation and Technological Institute* and the *Kharkov Aviation Institute,* and numerous smaller civil research and training schools.

The Soviet Air Force itself runs both officer training institutes, such as the *Air Force Academy,* near Moscow, from which come many of the Air Force commanders and which has a large hand in the evolution of new air tactics and strategy, and engineering and research institutes, such as the *Riga Air Force Engineering College* and the *Kuibyshev Military Engineering Academy,* which specialize in the training of maintenance and auxiliary equipment experts and building and constructional engineers.

Russian designers are aided by a number of German technicians who have settled in Russia. The status of these Germans is not clear. Many are receiving excellent pay and certain privileges to keep them in Russian employ; others less willing to go to, or stay in, the Soviet Union are doubtless forcibly held there under close supervision. It may be that the ideology and principles of the German aircraft



MIG-15 flown on Korean front by Chinese Reds is also in service in Eastern Germany. Wing sweep is 35°. Note dive brakes below tail.

technicians were diametrically opposed to Communism, but ideologies have a habit of going by the board when it comes to a choice between their retention in acute discomfort and their refutation in comparative ease and luxury, and there is much evidence to show that most of the latest Soviet aviation developments are the result of combined Russo-German brains.

Turbojets, Weapons, Radar/Radio

A dangerous bottleneck in the supply of jet combat airplanes for the SAF is the small output of reliable gas turbines. There is as yet no intimation that the Reds have succeeded in producing a turbo-jet of original design; all production engines being based on German axial-flow designs by Junkers, B.M.W. and Heinkel-Hirth and, reportedly, the Rolls-Royce centrifugal-type Nene unit, a quantity of which were supplied to Russia by the British Government at a time when international relations were still officially cordial.

The first effects in the jet engine field of the influx of German knowledge and technical assistance, both theoretical and practical, were the production of Russian versions of the Junkers Jumo 004B and B M.W.-003 axial-flow gas turbines which were, at that time, giving 1,990 lbs. s.t. at 9,500 rpm, and 1,890 lbs. s.t. at 8,700 rpm, respectively. Simplified, from the production standpoint, and prepared for Soviet manufacture by Engineers Svetzov and Chelomey, the units were redesignated M-003 and M-004 and installed in Russia's first jet fighters, the single-jet Yak-15 and the twin-jet MIG-9, to be described later.

In both of these airplanes the turbo-jets are slung under the fuselage nose in order to simplify their removal for maintenance. This layout was found to be necessary as, in the case of the Jumo 004B, the whole power unit had to be stripped for cleaning and overhauling of the compressor and for detailed inspection of the turbine wheel and combustion chambers after only 30 hours' running. However, this work was remarkably simple and could be undertaken by relatively unskilled women.

Neither the M-003 or M-004 is a suitable unit for development to give much above 2,500-3,000 pounds' thrust, and concentrated development is being given to the more powerful units by the same designers, the Jumo 012 and B.M.W.018, which were in more transitory stages when taken over by the Russians. However, very great difficulties—also encountered in other countries—regarding the metallurgical aspects, methods and standards in the mass production of such axial-flow units have been, and still are being, encountered.

The B.M.W.018 was designed to give a thrust of 7,520 lbs. at 6,000 rpm, and the Jumo 012 was to have a thrust of over 6,000 pounds. Nothing is known of the stage reached in the development of the M-018 (as the B.M W 018 is now known) but reports indicate that the Russians have at last placed the Jumo 012 in quantity production. Redesignated M-012H, this unit is at present giving a static thrust of about 4,000 lbs. at 9,000 rpm, but the unit is exceptionally long (177 inches) and bulky, and, owing to the extensive use of steel, the dry weight is some 4,750 pounds—nearly twice that (*Continued on page* 55)

MAIN AIRCRAFT TYPES IN SERVICE WITH SOVIET AIR FORCE

FIGHTERS

Designation	Engines	HP	Max. MPH	Cruis. MPH	Span	Length	Armament
Yak-9P	VK-107A	1600	370	195	32'0"	27'10"	1 x 20mm 2 x 12.7
Yak-3	VK-107	1310	402		31'0"	29'0"	1 x 20mm 2 x 12.7
La-9	ASH-82 FNV	1850	410	340	30'0"	35'3"	1 x 20mm 2 x 12.7
La-11	ASH-82 FNV	1850	400	340	28'0"	32'0"	3 x 20mm
		Lbs. S. T.					
Yak-15	M-004B	2000 plus	505	370	30'0"	28'0"	1 x 20mm 2 x 12.7
Yak-15B*	M-004	2000 plus	505	370	30'0"	28'0"	2 x 20mm or 30mm
Mig-9	Two M-003	2000 plus	595	450	34'0"	32'9"	3 x 20mm 1 x 43mm
Yak-17*	M-003 or M-004	2000 plus	Approx. 550				
Yak-19							
Yak-21*	HWK 509-C	4500	Approx. 670		30'0"	19'0"	
MiG-15			640		33'0"	33'0"	1/2 x 20mm 1/2 x 30mm
La-17			620		39'6"	37'0"	1 x 20mm 1 x 30mm

BOMBERS AND ATTACK AIRCRAFT

Designation	Engines	HP	Max. MPH	Cruis. MPH	Span	Length	Armament
Tu-2	Two ASH-82	1850	345		62'0"	46'0"	2 x 20mm 3 x 12.7
Tu-4	Four M-90	2000 plus			141'0"	99'0"	
Tu-6	Two ASH-82	1850			72'0"	46'0"	
Pe-2	Two VK-105R	1100	322	195	56'3"	41'6"	4 x 7.62 2 x 12.7
IL-10	Alternative VK-107 AM-42	1800 2000	333		45'0"	38'0"	2 x 30mm 1 x 20mm 2 x 7.6mm
Tu-10*	Two M-012H*	4500*	Approx. 540	Approx. 450	65'0"	60'0"	

TRANSPORT AIRCRAFT

Designation	Engines	HP	Max. MPH	Cruis. MPH	Span	Length	Armament
Li-2	Two M-62R	1000			95'0"	64'6"	
IL-12	Two ASH-82 FN	1775	252	208	104'0"	70'0"	
IL-18	Four ASH-82	1775	265	230	131'0"	99'9"	
Tu-70	Four M-90	2000 plus		207	141'0"	119'0"	
Yak-16	Two ASH-21	690	230	195	65'3"	51'0"	
Shche-2	Two M-11D	145			72'0"	52'0"	

TRAINING AIRCRAFT

Designation	Engines	HP	Max. MPH	Cruis. MPH	Span	Length	Armament
Yak-15**	M-004	2000 plus	500	370	30'0"	28'0"	
UT-2	M-11	110	120				
Yak-18	M-11RF	160		133			

* Reported but unconfirmed designation   ** Two-seat version

RUSSIA VS. USAF & ATLANTIC PACT PLANES

On the following two pages is a graphic representation of what Russia could throw in against the anti-communist European air forces which would oppose her in an outright war. Backing up the Atlantic Pact nations is the United States Air Force (shown at far right on page 25). Similar types are shown pitted against one another. Practically all the planes illustrated are operational except for one or two which are expected to be in the air and ready for battle by mid-summer.

USSR AIR FORCES vs. ATLANTIC

PACT AIR FORCE & USAF

here come the TURBO-PROPS

By ANDREW R. BOONE

Offering a number of advantages over piston engines, the turbo-prop is rapidly being developed to power a great variety of aircraft types

Forerunner of future passenger plane, the turbo-prop-powered Convairliner.

■ News note: First all-turbo-prop airplane in the world to take wing, the sensational Convair XP-5Y1 flying boat now has been airborne over the Pacific several times. Second came the Douglas A2D Skyshark, a fighter-bomber that can outfly some fighters, outhit some bombers. Third, the twin-engine Convair Turbo-Liner, a bid by Allison and Convair to prove turbo-props are ready—and economical—for commercial service. Fourth—classified types not yet ready to be disclosed.

Why bother about developing a combination turbine and propeller engine? Why not stick to reciprocating engines and jets? "It became evident during the last war that we were running out of horsepower in piston engines," says Rear Admiral Alfred M. Pride, chief of the Navy's Bureau of Aeronautics. "We knew future requirements would demand far more power than the piston engine ever could provide. Yet these aircraft would have to carry loads over ranges that the fuel consumption of pure jets made impossible. We felt the turbo-prop could solve this problem by providing the horsepower for aircraft in the 450-600 mph class with a fuel consumption low enough to give them the load-carrying capacity and ranges of piston-powered types."

Adm. Pride poses the problem, suggests the solution. Now the Navy's turbo-prop program has produced two of the new type of power plants—one by Allison, the other by Pratt and Whitney. Already, turbo-props produce greater power than any conventional piston engine. Too, they're headed for heights beyond the dreams of fancy only a few years back. Ever hear of an aircraft engine developing 20,000 horsepower? It's coming!

Even now, you can have either a single or a double engine. The double is a novelty, especially with reference to the relationship between engine and propeller. More of that later. Unlike a pure turbo-jet, which drives by expelling hot gases rearward, the turbo-prop converts most of its thrust into horsepower by harnessing that thrust to a shaft which turns the propeller. Air is drawn into the intake at the front and compressed. Its temperature is raised by the addition of fuel and blown into a turbine which turns both the compressor and propeller shaft Some of the gas is propelled through the tailpipe to provide jet thrust, as in a pure jet engine.

Under the watchful eyes of a pair of engineering teams at San Diego, both the single and double Allisons are getting a flying work-out that should prove their merits. The single unit, powering the Turbo-Liner (a converted Convairliner), is designated Model 501. The double, powering XP-5Y1, is called the T40. The single is an exact duplicate of half the T40 and develops half the horsepower. Weight of the 5,500-horsepower T40 is 2,500 pounds—slightly better than two horsepower for each pound of weight.

Model 501 turns a single propeller. T40 turns contra-rotating props. Thereby hangs a tale of power and flexibility. With the twin, economical cruise power is obtained by cutting out one power section and permitting the operating section to run at its most efficient point. Of considerable importance, through the gear box that operating power unit continues to drive both props. There's no feathering to set up a hindering drag. By this means more economical cruise is attained than with a single unit operating at half its maximum cruise rating.

"To obtain maximum range for an airplane powered with a single-unit turbo-prop engine," explains

This powerplant, because of its low weight for power, offers excellent range and payload, and for passenger comfort, vibrationless ride.

John Kline, Allison engineer, "it is necessary to go to extreme altitude. At lower altitudes, the airplane requires less power, but, conversely, turbine engines consume fuel at a much higher rate. Here is where a twin unit maintains an advantage in flexibility, and permits the pilot to select the best flying altitude. In such an airplane as the 5Y1, with four double engines, the pilot has eight power sections under separate control. With this number of independent power units, he can select any of five different power settings by cutting out from one to five sections. Aircraft with double engines will have as much as 20 percent greater range than its opposite number with single-unit engines."

With the Turbo-Liner, Convair hopes to provide for the Air Force an advanced navigational trainer. XP-5Y1 not only is a much-advanced seaplane; it is the forerunner of an entirely new class of flying boat whose hulls should make history in years to come. Already the Turbo-Liner modification shows clearly that no air-frame problems will interfere with modifications of other transports to TP. Actually, a saving of 1,400 pounds was effected under the conventional (*Continued on page* 66)

Allison's Bid for Jet Leadership

By T. S. McCRAE

Assistant Director of Engineering, Allison Division, General Motors Corporation

■ A mass flight of 10,000 airplanes circling the world at the Equator, flying 500 miles an hour—

Any such single achievement would stretch the imagination to the bursting point. Yet, if all the flight experience with turbo-jet engines built by Allison Division of General Motors in the last five years could be lumped together in one tremendous project, that could be the result.

Instead, however, experience comes in small pieces and the nearly 500,000 hours of flight time with Allison engines have been built up by many flights over many spots of the world and under widely differing conditions.

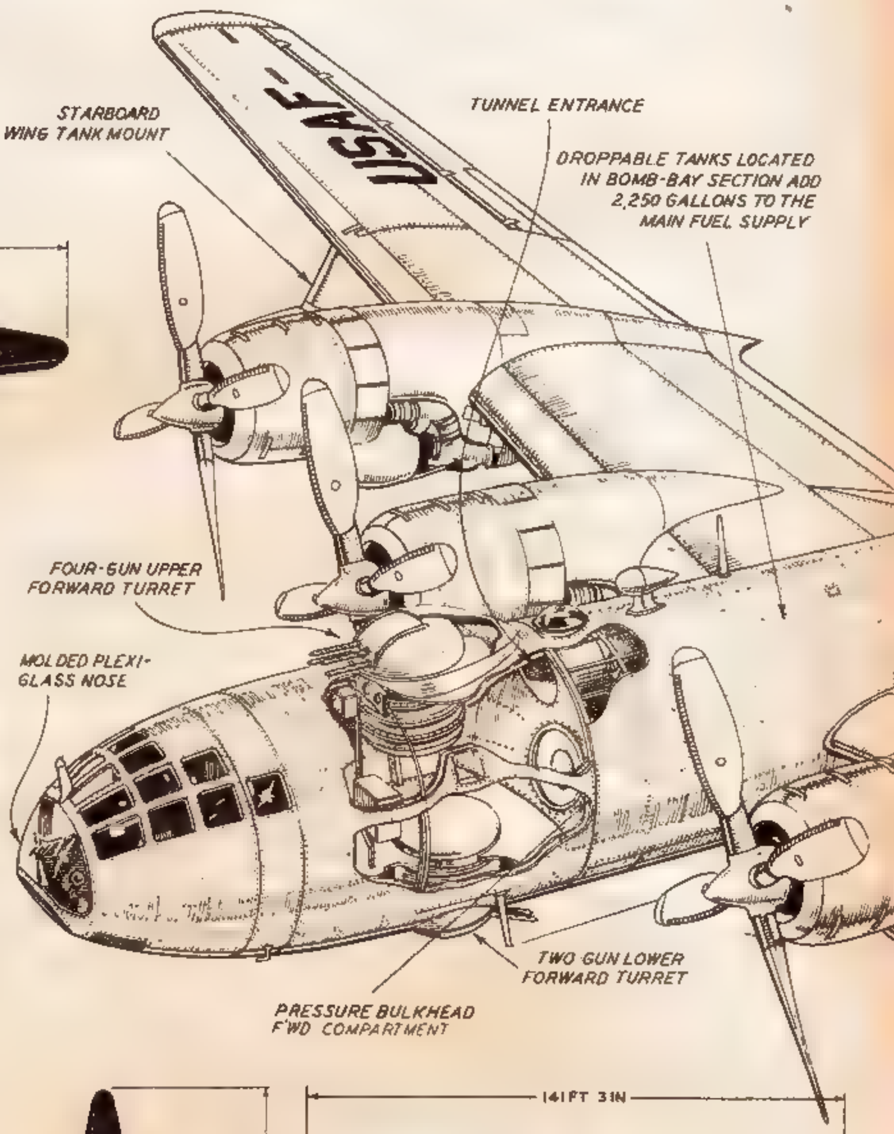
It's that kind of experience which makes progress possible and which has resulted in improved dependability and increased power ratings for J33 and J35 turbo-jet engines which Allison now is delivering to the military services.

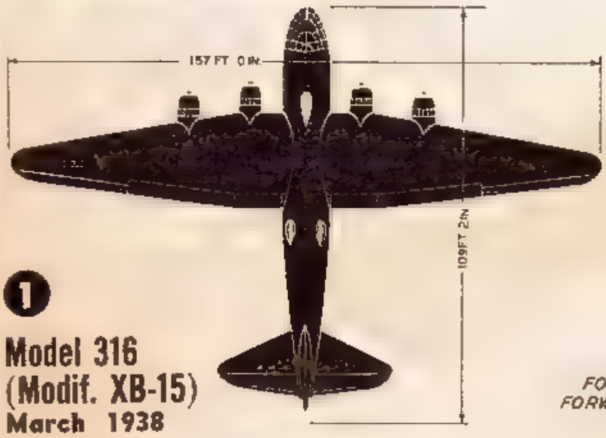
Allison entered the jet engine field in 1945, near the end of World War II, when jet engines were so new there weren't blue-prints of models available to use in pricing or preparation of a production schedule. Yet, when it was agreed this country needed both development and production programs in jet engines, Allison applied the experience gained in the production of over 70,000 liquid-cooled reciprocating aircraft engines and proceeded to turn out jet engines on (*Continued on page* 68)

By DOUGLAS ROLFE

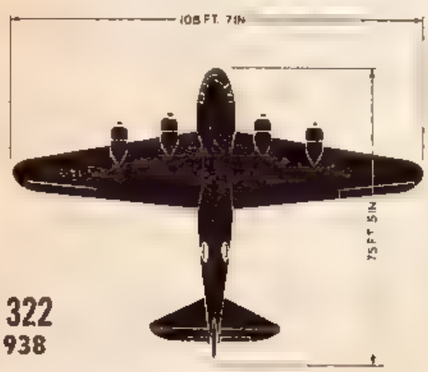
EVOLUTION OF THE SUPERFORT

Design growth of B-50D long-range bomber began in '37

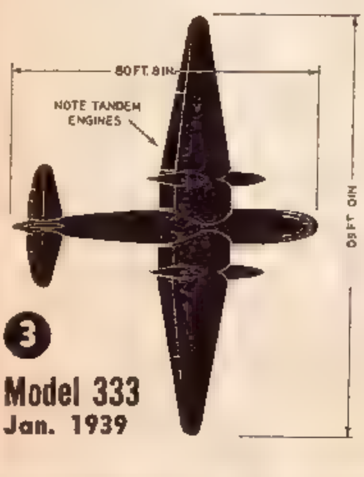




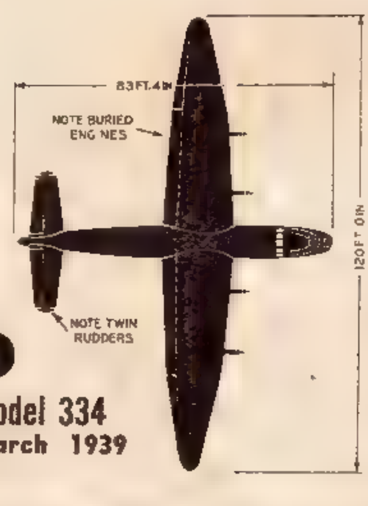
1
Model 316
(Modif. XB-15)
March 1938



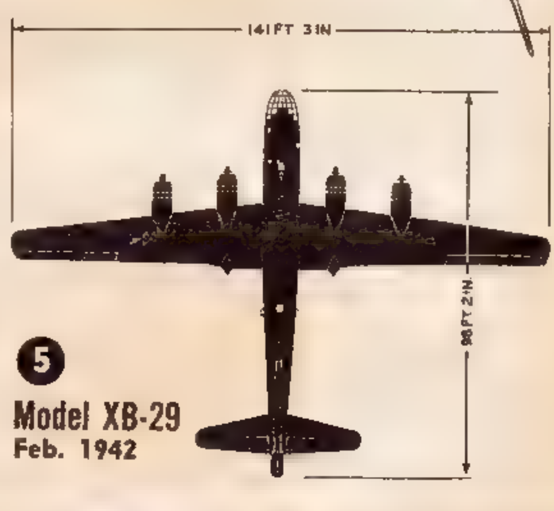
2
Model 322
June 1938



3
Model 333
Jan. 1939



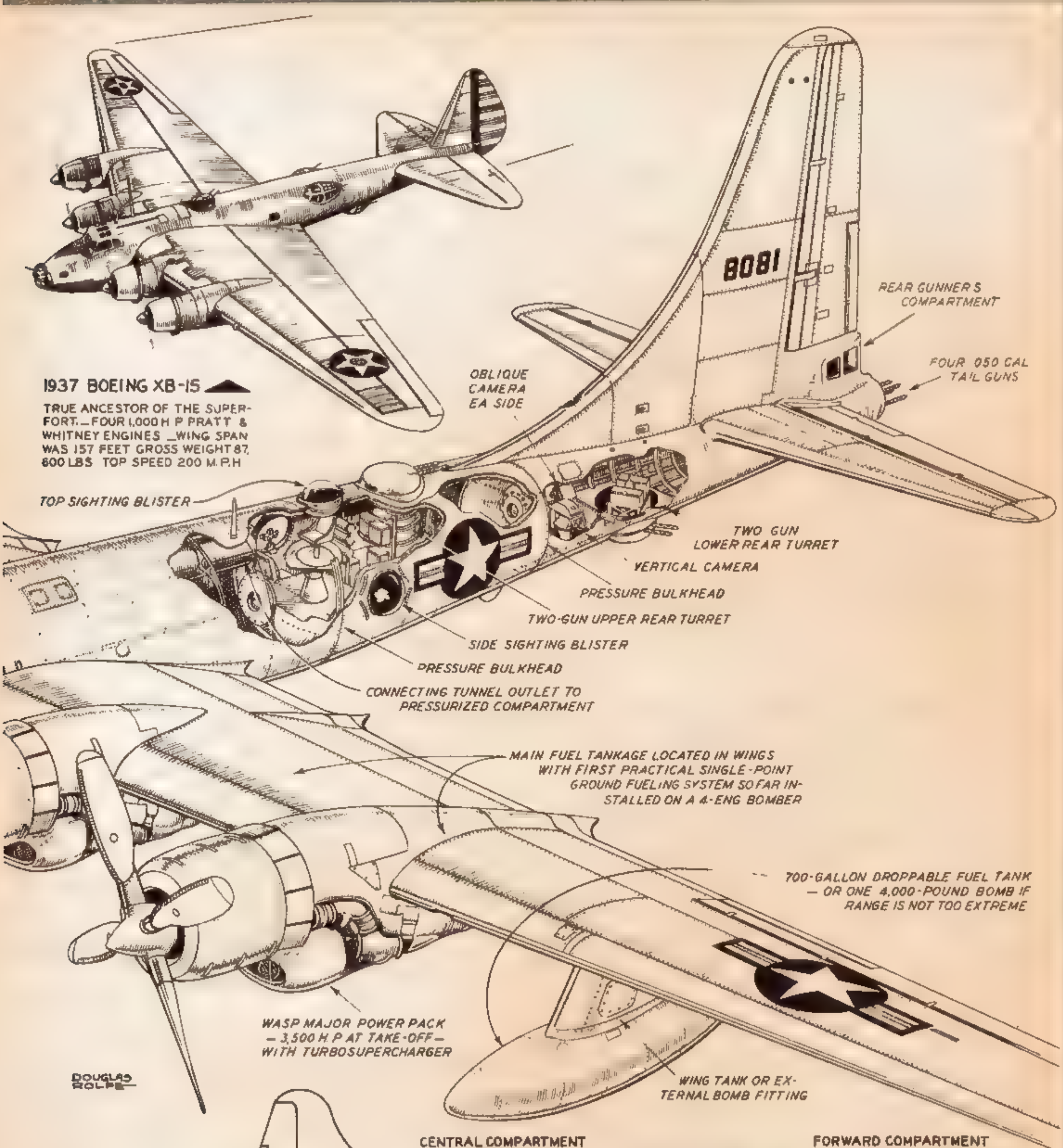
4
Model 334
March 1939



5
Model XB-29
Feb. 1942

All top-views same scale

[illegible] designed to use four 2,000 hp radials. Next project, Model [illegible]



PRESSURIZED SECTIONS OF THE B-50

Instrument Technician

Everyone who flies, be he pilot or passenger, is dependent upon the skill of this unsung but very important fellow back in the shop

■ Jerry Smith peered intently at the gyrosyn. The intricate instrument had been laid gently on his bench only a few minutes earlier. Now it awaited the magic touch of his talented fingers

Jerry is an instrument technician. In some quarters he's called a shop mechanic. Actually, Jerry—and many others like him—is an amazing sort of fellow. He it is who assures captains of the airline planes they can believe their eyes when they scan the instruments dotting their panels. Jerry makes certain all those nine flight, 10 engine, 19 electrical and 11 warning light gismos are on the button. Those are types. Individually, a four-engine transport carries many more devices, all of which reveal how something, somewhere on the airplane, is working

Jerry knew how the gyrosyn functions. A signal from the earth's magnetic field is transmitted via a compass pick-up element out on one wing to the gyrosyn, and the gyrosyn holds the plane on the desired heading. All Jerry had to do was make sure four small electric motors and one precession coil, five transformers and an assortment of resistors, condensers and magnetos were clean, smooth running, synchronized and equalized. How he achieved this minor bit of legerdemain is no part of this account. That takes training, the sort Jerry got in a CAA approved school. Plus experience, the kind he got during three years working in the instrument shop of his airline

Jerry considers himself lucky for having graduated from a CAA-approved school. He landed a job with his airline as an apprentice. But management, appreciating the knowledge and experience he had gained earlier, credited him with a two-year salary advance. He started 60 cents an hour higher than would a rank beginner. He won other advances more rapidly, too, a benefit that will follow him throughout his career

"A fellow like Jerry," you learn from Louis Kasparek, Western Airline's instrument chief (shown in the lead photo), "knows his way about. He knows that a manual accompanies every type of instrument. He can find detailed repair procedures in black and white. If he has attended an accredited school, he already has torn down and re-assembled a bunch of gyros. Of course, he still has a lot to learn in the shop where he works. Experience will continue to be his teacher. But he works swiftly, and he can find the detailed helps without running to his chief every few minutes."

Few jobs in aviation offer a man a wider range of activities. Instruments break down into four categories: pressure, gyroscopic, electrical and optical. This gives you an idea:

Pressure—rate of climb, altimeter, such gauges as oil, fuel, hydraulic and air

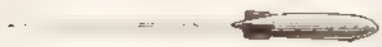
Gyroscopic—this is the most intricate of all, and can be learned only in schools. The airlines and other employers do not have time to teach beginners. It embraces the gyro horizon, the directional gyro, and the auto pilot (which combines the bank and climb instrument with the directional gyro).

Electrical—many are represented here. A few include indicators for fuel quantity in the tanks, air temperature gauges, carburetor temperature, cylinder temperature, flashers (position light indicators) and oil pressure

Optical—drift meters and sextants. These are needed in trans-ocean flying only

Jerry, being of what he calls average talents, started on pressure instruments—they're the most simple. It was nearly a year before his department chief permitted (*Continued on page 76*)

BIG DIRIGIBLES



for the Airlift

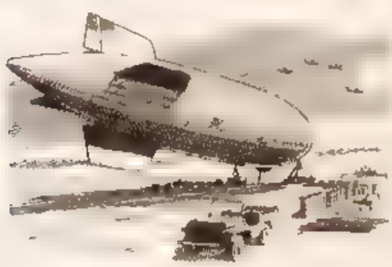
A commercial airship line would give helium-rich U. S. a fast-moving merchant marine of the air

By P. W. LITCHFIELD

Chairman of the Board, The Goodyear Tire & Rubber Co., Inc.

■ With our experience in Korea giving us a second reminder (the Berlin Airlift being the first) of how important the speedy and economical movement of supplies and war material overseas is in emergency, it is my considered judgment that America should take steps immediately toward developing the advantages of rigid airships.

I am not talking about blimps. The smaller airships were useful members of the Navy's "hunter-killer" team in the battle against submarines in World War II, became accepted units of our military forces. I am happy to say that a strong blimp program, using greatly improved ships, is in the making. What I have in mind is the big Zeppelin-type airships to supplement America's airlift as large-capacity, long range and relatively high-speed cargo carriers.



Our national interest in events beyond the Pacific seems certain to continue. The distances are great. Korea proved that huge quantities of military supplies are needed to make our power effective and that delays in delivery are costly in men's lives.

And yet, in the big airships, we have at our disposal, and are not using, a vehicle which can transport large quantities of gasoline and fuel oil for planes and tanks, or vital parts and replacement equipment for our fighting machines overseas, carry much greater loads than the largest cargo planes three or four times as fast as our surface ships, which can land to a portable mooring mast erected wherever there is air cover, *and not worry about submarine attack.*

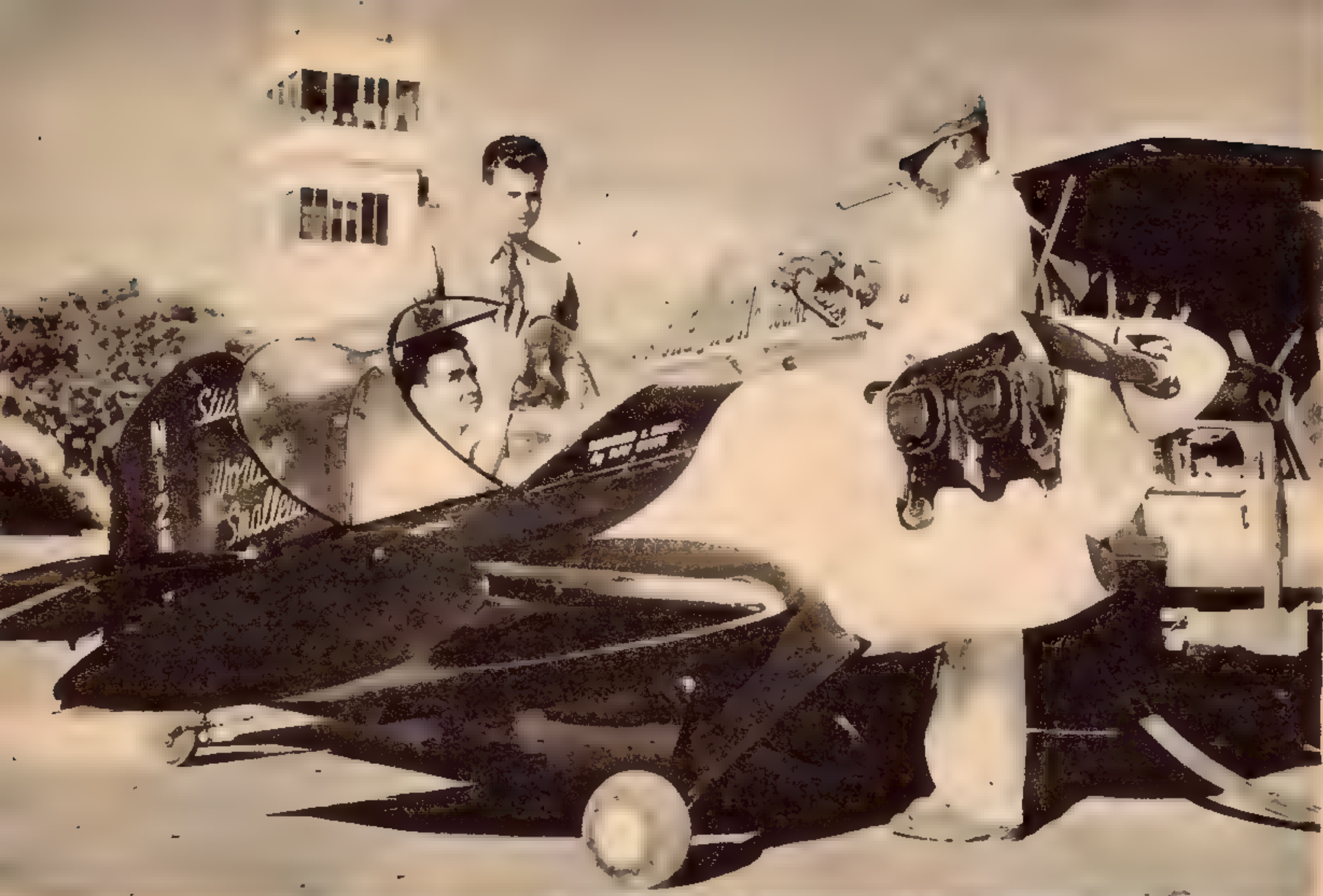
That submarine menace, in the case of our merchant marine, is much greater today than ever, because of the development in Germany, late in World War II, of the high-speed, long-range, snorkel-type of submarine. The shipbuilding bases in the Baltic where these were built, fell into Russian hands after the war, along with German experience and technique. It is no secret that Russia has taken full advantage of this situation, has a head start in snorkel procurement over any other country, including America.

Had the snorkels been available to the enemy in 1941 instead of 1945, we would have found it very difficult (and here I quote a high ranking Naval authority) "to justify transporting an army overseas when we were very uncertain that we would be able to supply our overseas forces."

Supply is vital in modern warfare. Yet we saw vast quantities of war materiel pouring into ports along both seaboards in World War II, of which only a small part could be sent out by transport planes, no matter how badly needed. The rest had to go by slow surface vessels, and at times through sub-infested waters.

Another advantage which the airship has, and one not generally realized, is its great fuel economy. It does not depend on its engines to keep it in the air, any more than a surface ship does to keep afloat. The airship climbs into the air, and stays there through the buoyancy of its lifting gas, helium. *The airship uses its engines only to drive it ahead.* Consequently it uses only a fraction of the fuel in crossing the Pacific that a fleet of airplanes with equivalent carrying capacity would require. On missions over water where refueling points are far apart, the airplanes might use five times as much fuel to get to their destination and back as the airships.

I do not need to point out the necessity of making the most efficient use possible (*Continued on page* 71)



Miniature airplane or overgrown model? Bob Starr flies the craft with his thumb and index finger. She takes enough gas for one hour's flying.

Aerial Half-Pint

By JOSEPH STOCKER

Amid jeers of his friends aviation mech Ray Stits designed and built the smallest airplane in world

■ Raymond Stits is a young aviation mechanic and self-taught aeronautical designer who loves to confound the skeptics. And he's been doing just that for the past couple of years or more.

When he let it be known at Kellogg Field in Battle Creek, Mich., that he was going to build the world's smallest airplane, the skeptics called it "Ray Stits' folly." But the plane got built. Then the wise guys said it would never fly. It flew. Well, O.K., said the know-it-alls, but it won't fly very high. Whereupon Ray's pilot wriggled into the cockpit and took the mite up to 3,300 feet

Life has been full of such delights and satisfactions since Ray and his pilot, Bob Starr, began to carve a thin swath across the country—from air show to air show—with the Liliputian aircraft which Ray calls the "Stits Jr."

There seems to be no doubt at all that it is indeed the world's smallest plane. Ray has checked every possible source and found none other even to compare with it. Just to give you an idea of its minuteness, here are some of the dimensions of the Stits Jr.

Wingspread—8′ 10″ (just a little over the span of a man's outstretched arms). Overall length—11′ 4″. Weight—398 pounds. Height—4′ 4″ (about as high as a man's ribs)

If statistics still don't quite convey the idea, consider the fact that the pilot of the Stits Jr. can reach out to either side from his cockpit and touch the ailerons. Or he can reach backward and touch the

tail surfaces. Given extra-long arms, he might even be able to reach down from the cockpit and touch the ground.

But the performance of the Stits Jr. wholly belies its half-pint dimensions. As Ray puts it, as though he himself must marvel a little at what he has wrought, "It isn't supposed to fly but it does." And, more than merely flying, the Stits Jr.—powered with an 85-horsepower Continental engine—clips off a top speed of 170 miles per hour. It cruises at 150, lands and takes off at about 60. "That's what astounds people the most," says Ray. "It stalls out at 58 instead of 120. It comes in like a rock."

The plane takes off in 500 feet, lands in 800 and has an 850-feet-a-minute rate of climb. Ray claims a service ceiling of 12,000 feet for his pygmy, but the ship has never tried for the ceiling because it carries only 4½ gallons of fuel—enough for no more than an hour of flying time.

Although the plane is sturdily built (two men can stand on each tiny wing to demonstrate its stress), the factors of weight and balance are exceedingly delicate. The pilot carries no chute. A chute weighs 25 pounds, and that's just 25 pounds too much. When the ship is parked in the hangar, Ray keeps a bag of rocks in the cockpit. This is because she has a tendency to be nose-heavy on the ground and someone leaning thoughtlessly on the prop could cause her to kneel over and kiss the cement

The elfin wings have no tips. They're chopped off square. With wing tips, says Ray, "there would be extra drag and no extra lift, and with this thing you need all the lift you can get." To provide more lift, Ray attached tip plates to the wing-ends. They prevent the flow of air off the wing-ends and the effect has been to cut landing speed by 5 mph.

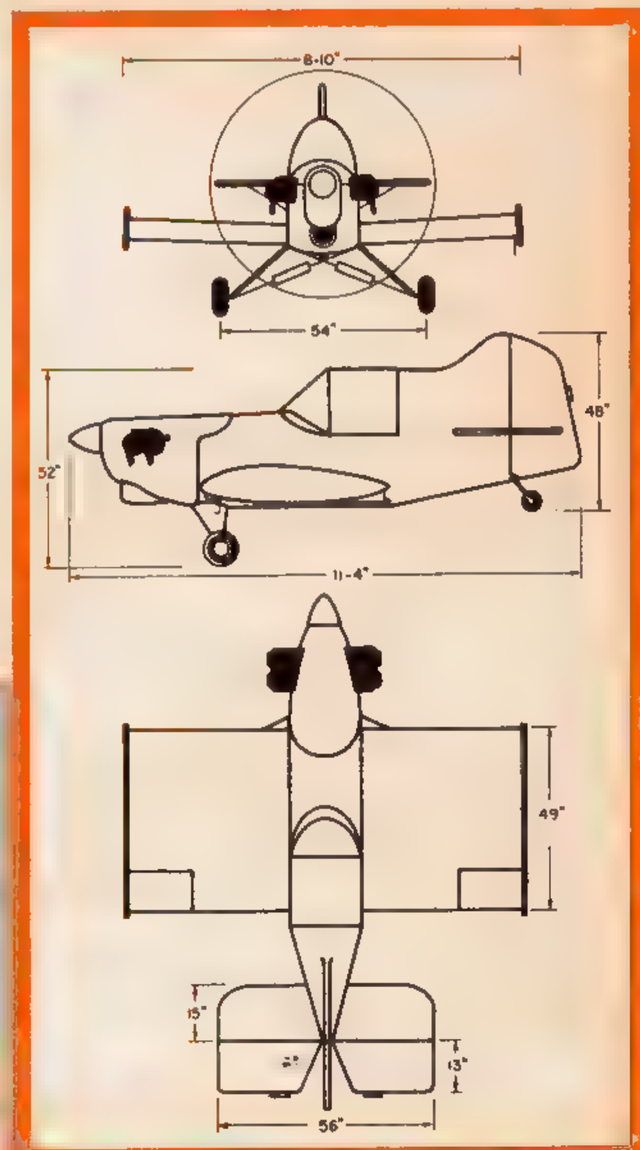
The radio is an Airboy Jr., for receiving only. It's half the size of a cigar box and is clamped near the floor board, between the rudder pedals. The instrument panel is simplicity itself—nothing more than a temperature gauge, airspeed indicator, oil pressure, altimeter and tachometer.

Why was the midget built in the first place? No particular reason, except that Ray Stits, besides being the kind of guy who loves to confound the skeptics, is also the kind of guy who loves to take a dare.

"Everybody was claiming to have built the world's smallest airplane," he says. "So I decided I'd really build the smallest. I decided I'd show 'em how small a plane could be and still fly."

In 1948, while he was working at Kellogg Field, Ray started building the Stits Jr. in his spare time. He used old cast-off fuselage material. For the landing gear, he got two BT-13 tailwheels, 10 inches in diameter. He converted a bicycle brake into a tail brake, controlled from a lever on the stick.

The prop was a problem. It had to be just so. Ray asked the Hartzell Propeller Co. of Piqua, Ohio, to design one specially for the Stits Jr. The Hartzell people weren't quite sure (*Continued on page* 68)



Bonanza pilot: "Egad, man, but those radio-controlled models sure do look realistic! Looka that figure in the cockpit, looks almost real."

START YOUR CAREER IN AVIATION

WITH THE AIR ADVENTURERS

■ We're happy to report good progress on the series of manuals for Air Adventurers club members which will take the individual AA'er up through the ranks from Apprentice Class Airman to Command Airman. These manuals are being prepared with the assistance of aviation leaders and advisors from the Government in Washington, D. C. They are designed to help you prepare for passing the various ratings as well as give you information on the establishment of Flights and Squadrons.

When all the booklets are available you'll find about all your organizational questions answered. In the meantime, here is data of interest to all Air Adventurers; the following information is in answer to queries from members.

Let's start with Leo Kozial of Pittsfield, Mass. Leo says, "I intend to form a Flight among my friends. I would like to know how we could have official recognition since each member will be writing in to you separately. I would also like to know what number, if any, we would receive when we are organized." A couple of good questions. First, membership files will be maintained according to state and city. When a sufficient number of members have signed up in a given area, all the names with their proper addresses will be sent to the individual organizing a group there. Each Flight or Squadron will receive a charter certificate to indicate official recognition of its establishment.

James Herschel, Orange, N. J., is really on the ball. He writes, "Your Air Adventurers club is music to my ears. In a short time you'll have 100% backing from my neck of the woods—already I have enough boys interested to make a Flight, but will wait patiently for my official instructions."

Concerning those extra membership application blanks so many of you have written about . . . additional membership forms will be included in all credentials when they are mailed from Headquarters.

From Ottawa, Ontario, David Applegate writes, "Congatulations on your far-sighted policy. As an aircraft mechanic for 14 years I have been trying to push your policy of preparedness in the air. There is a need for a similar policy here. I can only hope that living in Canada will not bar me from furthering your aim." Not a bit of it, Mr. Applegate. We need air-minded friends to the north of us. We'll be expecting an Ottawa Squadron to check in one of these days soon.

There's lots more information we want to pass on to you but space is limited here. It will all be found in the bulletins which will go out to each new member and to active AA'ers when they apply for upgrading in membership.

All we want to say before we get into Air Adventurers power model #2 (*Continued on page 56*)

AGE LIMITS: *There are no minimum or maximum age limitations on Air Adventurers Club membership.*

MAIL TO: Air Adventurers, c/o Air Trails, 304 East 45th Street, New York 17, N. Y. Print all information required on the application; sign where indicated. *At same time,* print your name and address on both labels and mail with coupon.

I hereby apply for membership in the Air Adventurers Club and promise to do everything in my power to uphold the principles of the organization and work for the advancement of American aviation. I enclose 25¢ in well wrapped coins for my credentials ☐; 50¢ for credentials *and pin* ☐—(indicate which).

....
(Name—print)

....
(Street address—print)

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(City—print) (Zone) (State)

....
(Age) (Sign here)

(AT5 51)

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(Name—print)

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(Address—print)

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(City, Zone, State—Print)

Print your name & address on both these forms and mail inside the envelope with your application form; they will be used as labels for mailing

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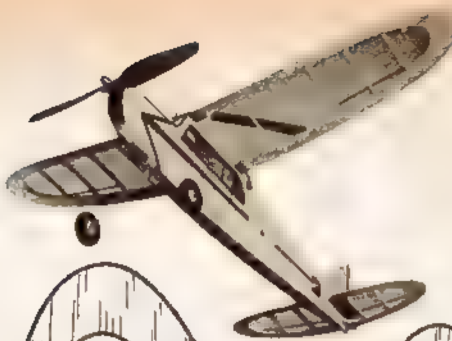
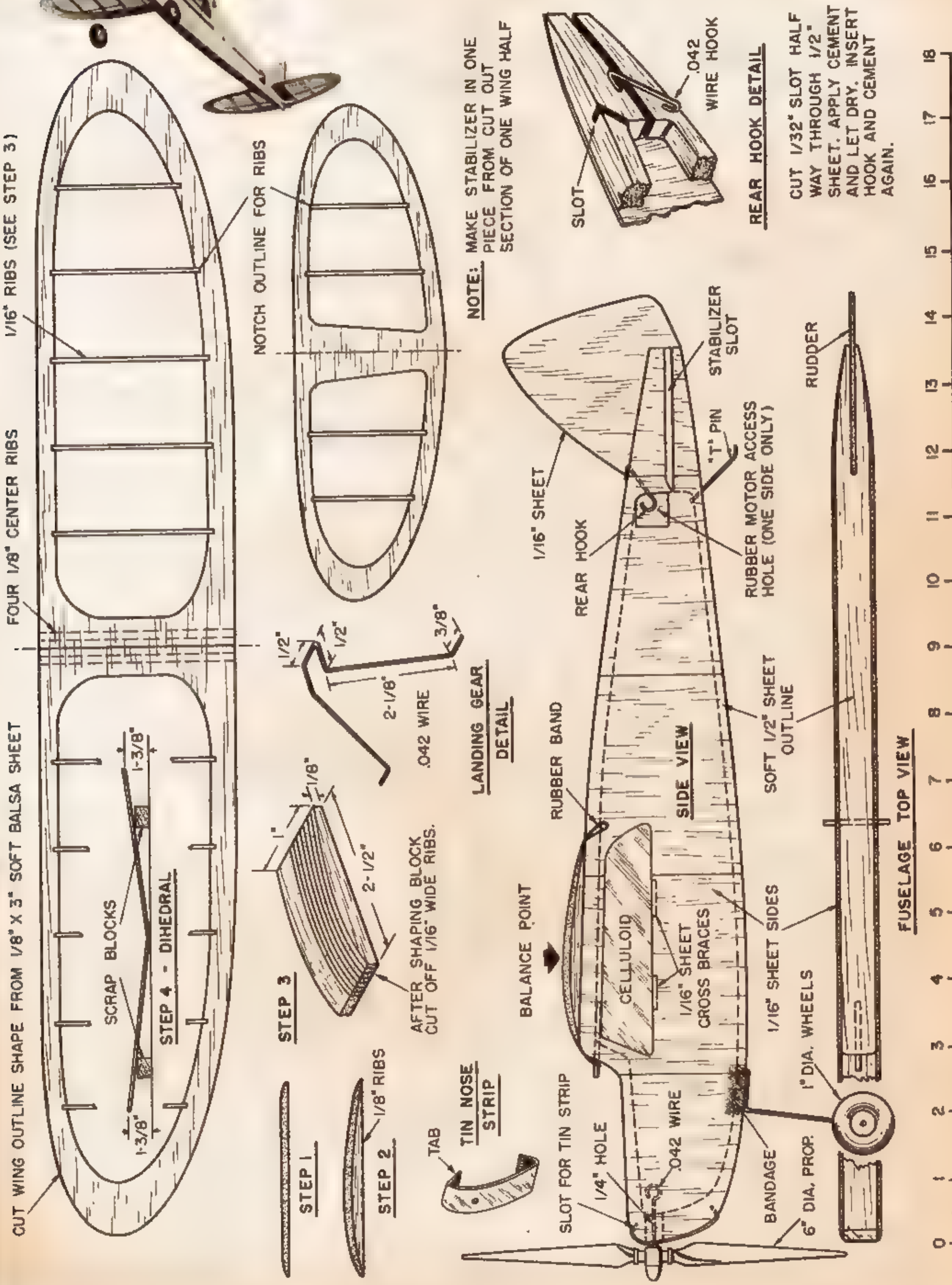
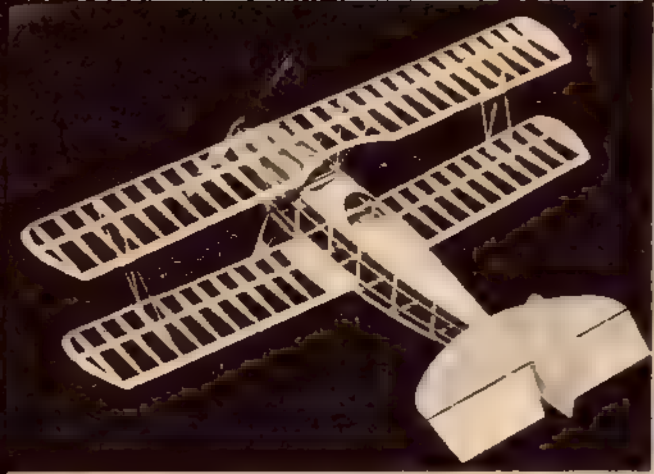
(City, Zone, State—print)

AIR ADVENTURERS POWER MODEL #2

A more advanced design for the more advanced Air Adventurer. This semi-cabin scale-type rubber-powered flyer will give excellent flights.







Fleet Trainer

One of the "most requested" old-timers, this not-too-tough biplane makes a beautiful flyer for stunt or sport

By CHARLES HOLLINGER

In the not too distant past Army and Navy flyers first took to the air in the Fleet "Bipe." A number of various models and power installations were used, and still are in service as primary trainers by foreign governments. This particular version, the PT-6, was powered by a Kinner K-5 engine of 100 hp. Just as the prototype was a flying fool, our model follows directly in its footsteps, leaving nothing to be desired as an out-and-out stunt ship plus the fact that its lines make for simplicity of construction.

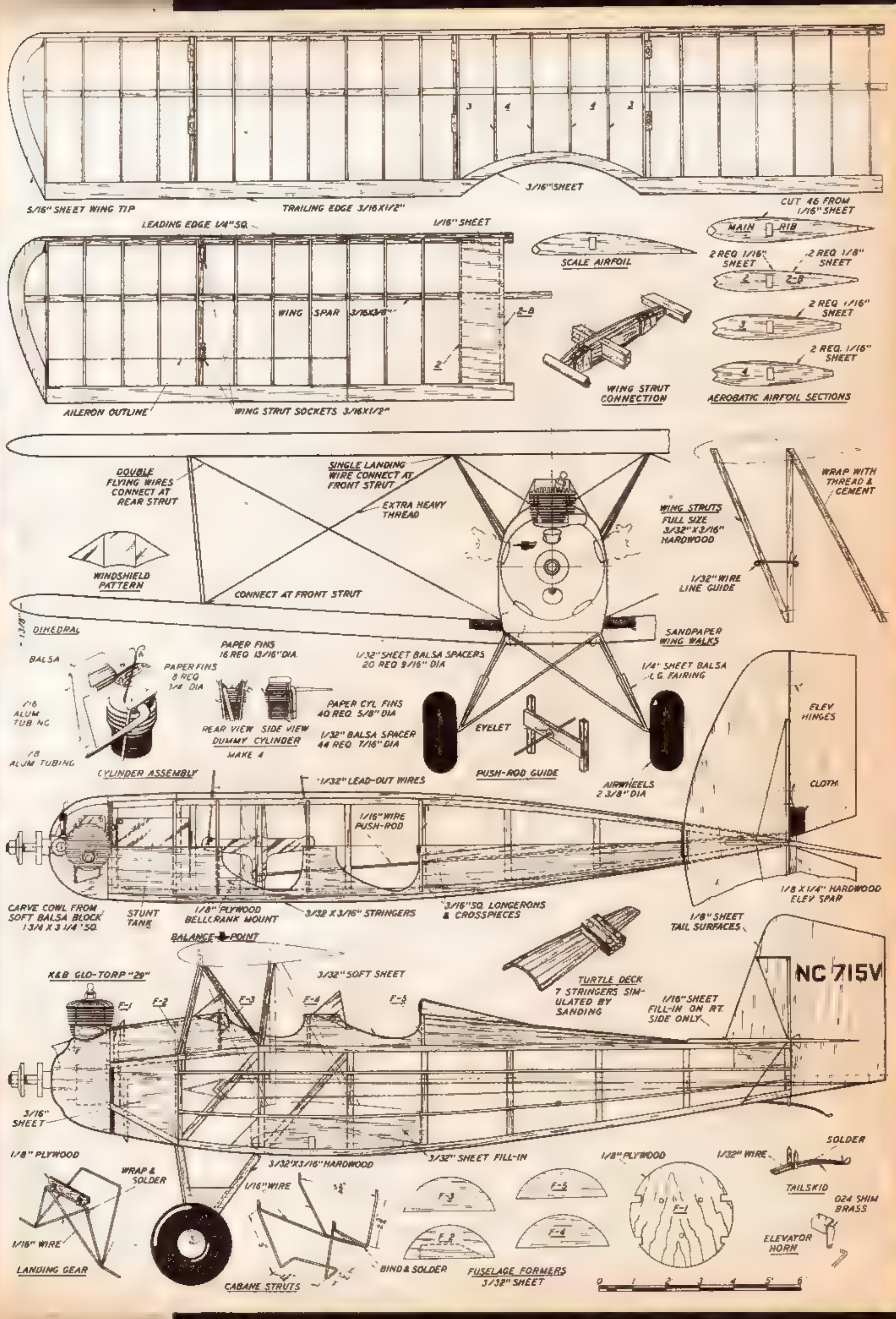
Even before the dummy cylinders were added, it won first place at the largest meet of the year in the Northwest. While competing at the 1949 Nationals it earned more than double the flight points of any other flying scale entry; this included the complete AMA flight pattern with the exception of consecutive vertical eights, wherein it received credit for one.

Let's start with the fuselage by selecting four strips of 3/16" sq. of equal strength and straightness. Make the two sides and join with crosspieces of the same stock. Cut out all formers of 3/32" sheet and the firewall from 1/8" plywood. Drill mounting holes in F-1 for your particular motor. Now temporarily mount motor by running bolts through firewall. Make a nut plate of thin sheet brass, slip over the bolts, cinch up on nuts and then solder these nuts to plate. Apply cement around the edges of nut plate so that it will stay in place on firewall when motor is removed.

The cabane struts are bent from 1/16" wire, soldered together and then cemented to top of fuselage. For extra strength wrap these struts to fuselage crosspieces. In bending the landing gear note that it is formed from two separate pieces, then wrapped with wire and soldered. Two brackets hold the gear to a strip of 1/8" plywood. This in turn is cemented into fuselage. A bellcrank support of 1/8" plywood may now be securely cemented in place, then bellcrank and pushrod can be installed.

Be sure to put in pushrod guide as shown in plans. Use hard balsa strips for stringers so that paper covering will not bow them in between the crosspieces. A sheet of 1/16" stock is used as a fill-in at tail where pushrod extends through fuselage and also where the lower wing panels butt against fuselage sides.

If you intend stunting the *Fleet* be sure to install the tank with its center line directly in line with needle valve jet when model is sitting level. Pick out some soft 3/32" sheet balsa for covering top of fuselage. Two separate sheets are needed. Cut sheets to approximate size and shape, then apply two (*Continued on page* 62)


5/16" SHEET WING TIP
TRAILING EDGE 3/16 X 1/2"
3/16" SHEET
CUT 46 FROM 1/16" SHEET
LEADING EDGE 1/4" SQ.
1/16" SHEET
MAIN RIB
SCALE AIRFOIL
2 REQ 1/16" SHEET
2 REQ 1/8" SHEET
WING SPAR 3/16 X 3/8"
2-B
2 REQ 1/16" SHEET
2 REQ 1/16" SHEET
WING STRUT CONNECTION
AEROBATIC AIRFOIL SECTIONS
AILERON OUTLINE
WING STRUT SOCKETS 3/16 X 1/2"
DOUBLE FLYING WIRES CONNECT AT REAR STRUT
SINGLE LANDING WIRE CONNECT AT FRONT STRUT
EXTRA HEAVY THREAD
WRAP WITH THREAD & CEMENT
WING STRUTS FULL SIZE 3/32" X 3/16" HARDWOOD
WINDSHIELD PATTERN
1/32" WIRE LINE GUIDE
CONNECT AT FRONT STRUT
1 3/8" DIHEDRAL
SANDPAPER WING WALKS
PAPER FINS 16 REQ 13/16" DIA.
BALSA
PAPER FINS 8 REQ 3/4 DIA
1/32" SHEET BALSA SPACERS 20 REQ 9/16" DIA
1/4" SHEET BALSA L.G. FAIRING
1/16 ALUM TUBING
PAPER CYL FINS 40 REQ. 5/8" DIA
ELEV. HINGES
REAR VIEW
SIDE VIEW
DUMMY CYLINDER
MAKE 4
1/32" BALSA SPACER 44 REQ. 7/16" DIA
EYELET
1/8 ALUM TUBING
CYLINDER ASSEMBLY
PUSH-ROD GUIDE
AIRWHEELS 2 3/8" DIA
CLOTH
1/32" LEAD-OUT WIRES
1/16" WIRE PUSH-ROD
CARVE COWL FROM SOFT BALSA BLOCK 1 3/4 X 3 1/4" SQ.
STUNT TANK
1/8" PLYWOOD BELLCRANK MOUNT
3/32 X 3/16" STRINGERS
3/16" SQ. LONGERONS & CROSSPIECES
1/8 X 1/4" HARDWOOD ELEV SPAR
1/8" SHEET TAIL SURFACES
BALANCE POINT
K&B GLO-TORP "29"
3/32" SOFT SHEET
F-1
F-2
F-3
F-4
F-5
TURTLE DECK 7 STRINGERS SIMULATED BY SANDING
1/16" SHEET FILL-IN ON RT. SIDE ONLY
NC 715V
3/16" SHEET
1/8" PLYWOOD
3/32" SHEET FILL-IN
1/8" PLYWOOD
1/32" WIRE
SOLDER
WRAP & SOLDER
3/32" X 3/16" HARDWOOD
1/16" WIRE
TAILSKID
.024 SHIM BRASS
1/16" WIRE
ELEVATOR HORN
LANDING GEAR
CABANE STRUTS
BIND & SOLDER
FUSELAGE FORMERS 3/32" SHEET
0 1 2 3 4 5 6

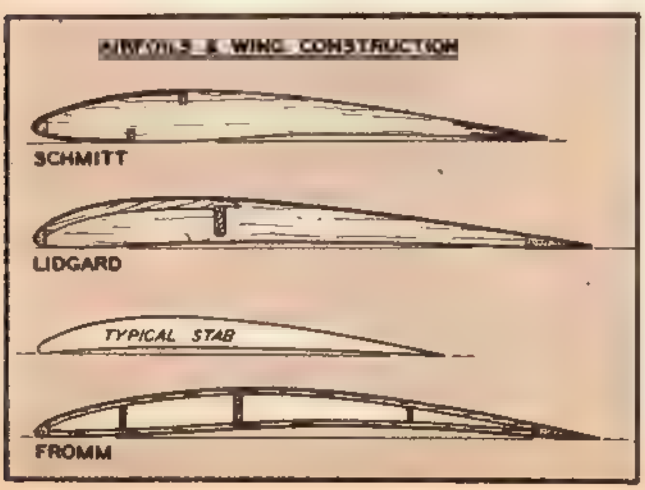
Four to Five

Internationally famous designer gives Wakefield model design tips

■ So you claim to be an avid modeler, hm? You're a sportsman who flies for the sake of competition. You get a big charge out of meeting other modelers and swapping ideas with them. If you beat them, you love it. If they beat you, you go home, re-design, and try again next time you meet.

O.K., if that's the case, you're a Wakefield flyer—or should be. And if you can make the American Wakefield team you get a crack at the most bitterly fought-for trophy in the sphere of international modeling.

Wakefield rules have been changed for 1951. However, most models designed under the old rules will still be eligible, though possibly at a disadvantage. Major changes are as follows:



Wing plus stabilizer area, projected, must fall between 263.5 and 294.5 square inches, with no allowances made for the area covered by the fuselage. Percentage of stab area is not limited.

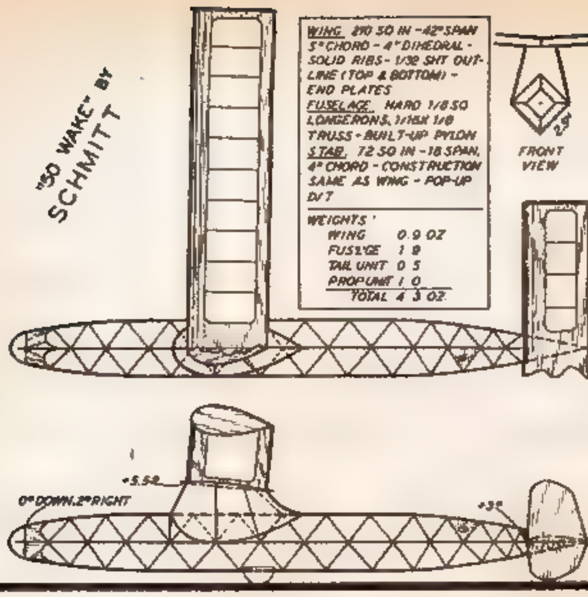
Fuselage cross-section must be more than ten square inches. Length of fuselage is entirely disregarded in reaching this figure.

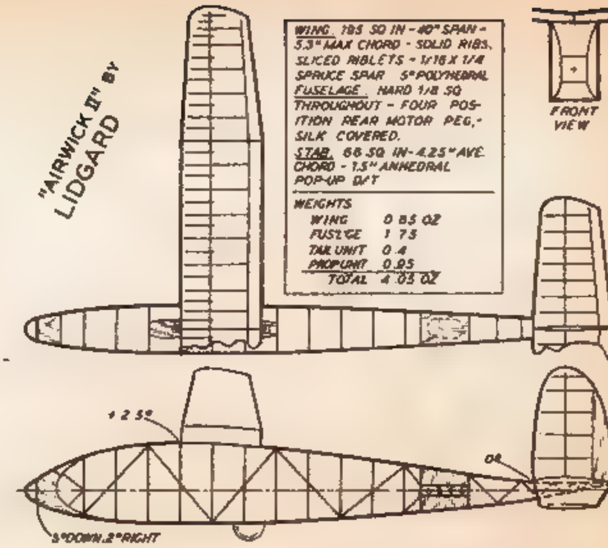
Model must weight not less than 8.113 ounces—230 grams.

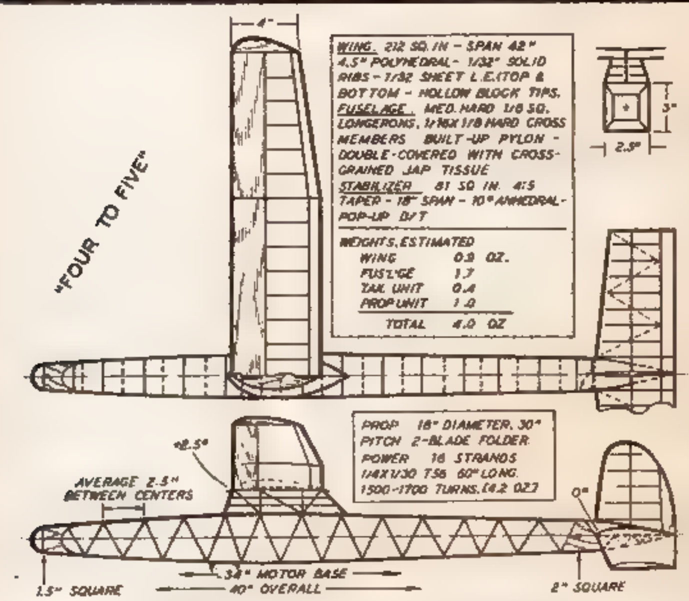
Model *must* R.O.G., but wheels are not necessary. Props and/or motors may be changed during the flying period. In cases of a three-flight tie a second model may be used for the fly-off fourth flight, but only in the event that the original model has been irreparably damaged or lost. And lastly, five seconds constitutes a delayed flight, with nine delays allowed. (Three delays equal an official.)

Aarne Ellila, of Finland, Wakefield winner in '49 and '50, flies a model reportedly capable of *better* than the allowed five-minute maximum flight. This, mind you, is *dead* air. No slight rising currents, no warm spots. Just dead, soggy air of the type in which the 1950 Finals were flown off in Finland. This is what you have to beat to bring the trophy back to the United States of America—and believe us, it's not going to be a cinch.

Getting on the team requires *almost* as capable a model. *Almost*, we say, because absolutely dead air conditions are rare in the States. Here, with a ship capable of four to four and a half minutes, we can chance snagging a thermal (*Continued on page* 63)

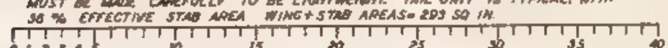


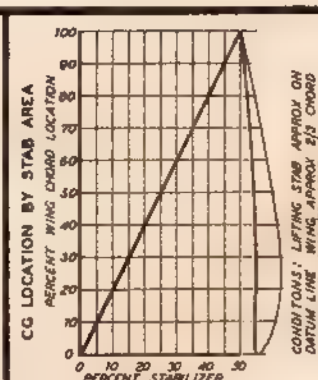


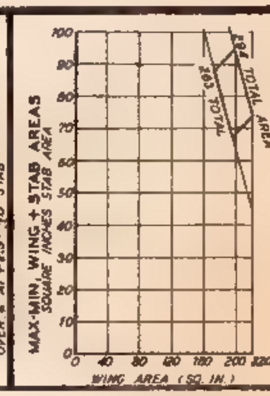


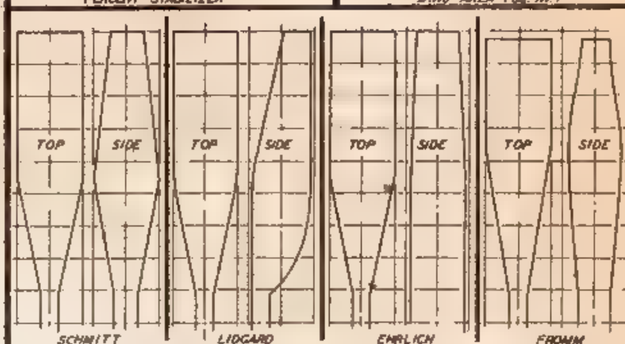
GENERAL LAYOUT OF A 1951 WAKEFIELD

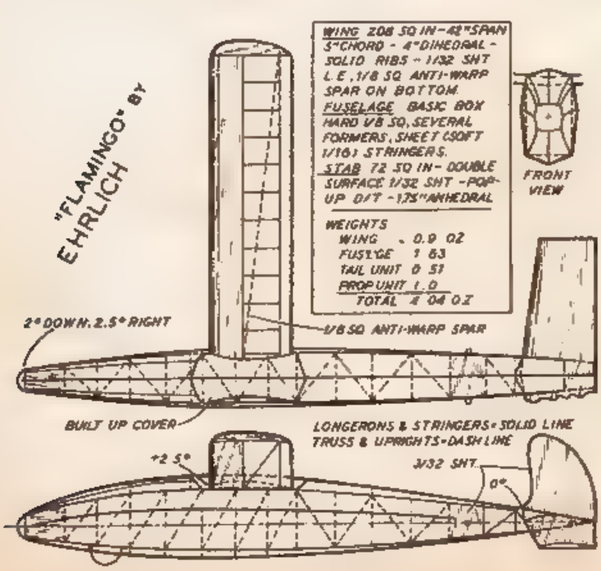
TAKING THE BEST (OR SIMPLEST) POINTS OF MODELS SHOWN WE GET SOMETHING LIKE THE ABOVE. THE LENGTHENED FUSELAGE TAKES A LONGER MOTOR, IS WELL-BRACED & SIMPLE TO BUILD. WING IS SIMPLE & RIGID, BUT MUST BE MADE CAREFULLY TO BE LIGHTWEIGHT. TAIL UNIT IS TYPICAL, WITH 36 % EFFECTIVE STAB AREA. WING+STAB AREAS= 293 SQ IN.

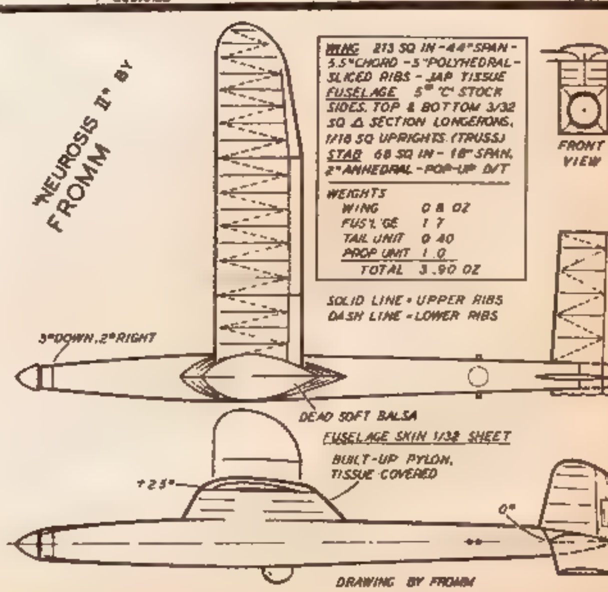












XF-92A

Rocket engine powers jet model for some spectacular flights

By LLOYD A. MOSHER

■ The original XF-92A was made as a simple whip-controlled model for a young friend of mine. Somebody suggested putting something in it to leave a smoke trail for a more realistic flight. Turning this thought over in my mind brought forth the idea of using the small Jetex engines—and *voila!*—eighteen models later, we have an aeroplane so realistic in flight that it has to be seen to be believed!

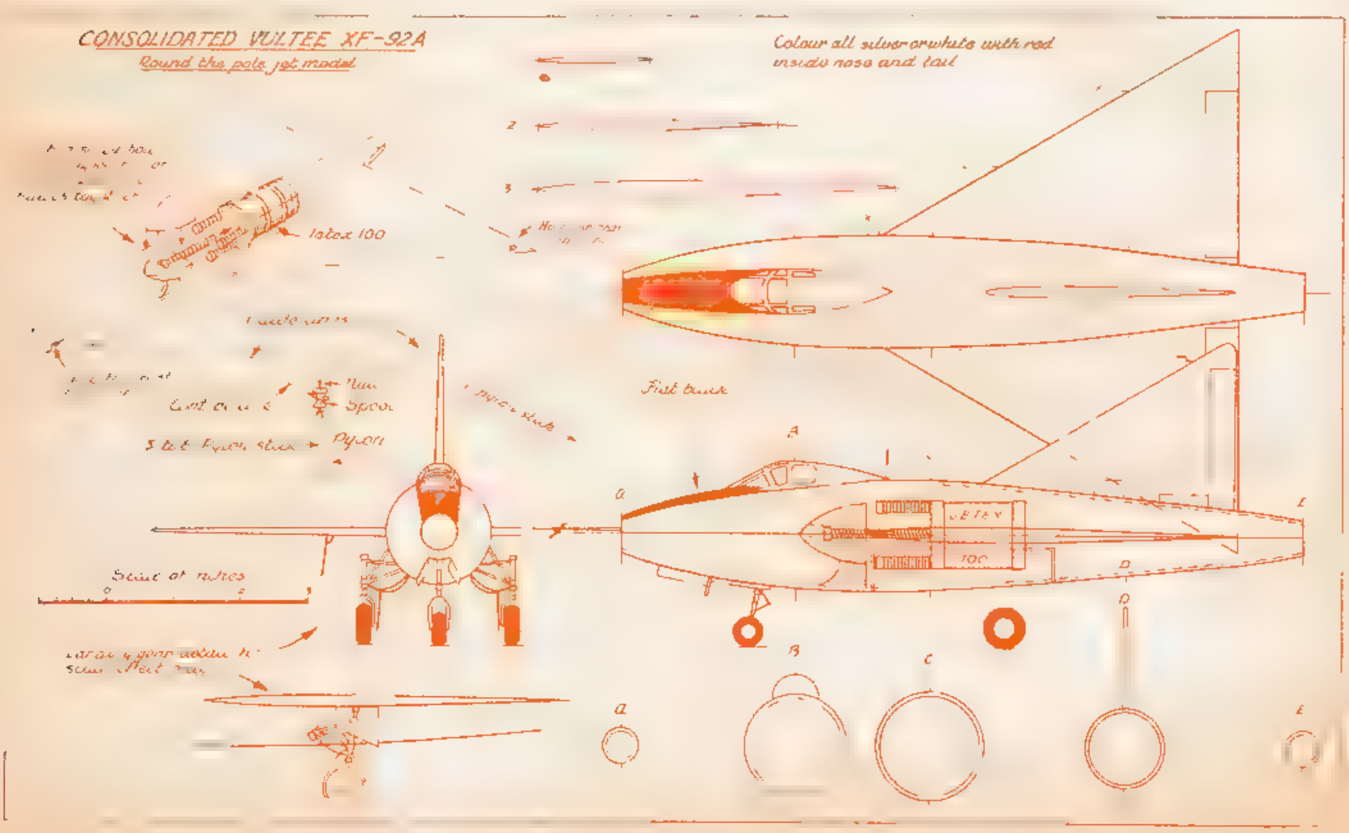
Its convenient size, lack of fuel odor or engine noise makes it an ideal "city" project as it can be flown anywhere without the numerous objections usually prevalent where the buzz of a gas engine can be heard. As it is not subject to hot fuels and is almost impossible to crash, you can spend all the time you wish on your doping job and know it will stay like that. After flying you can put it right back on your living room table for all to admire.

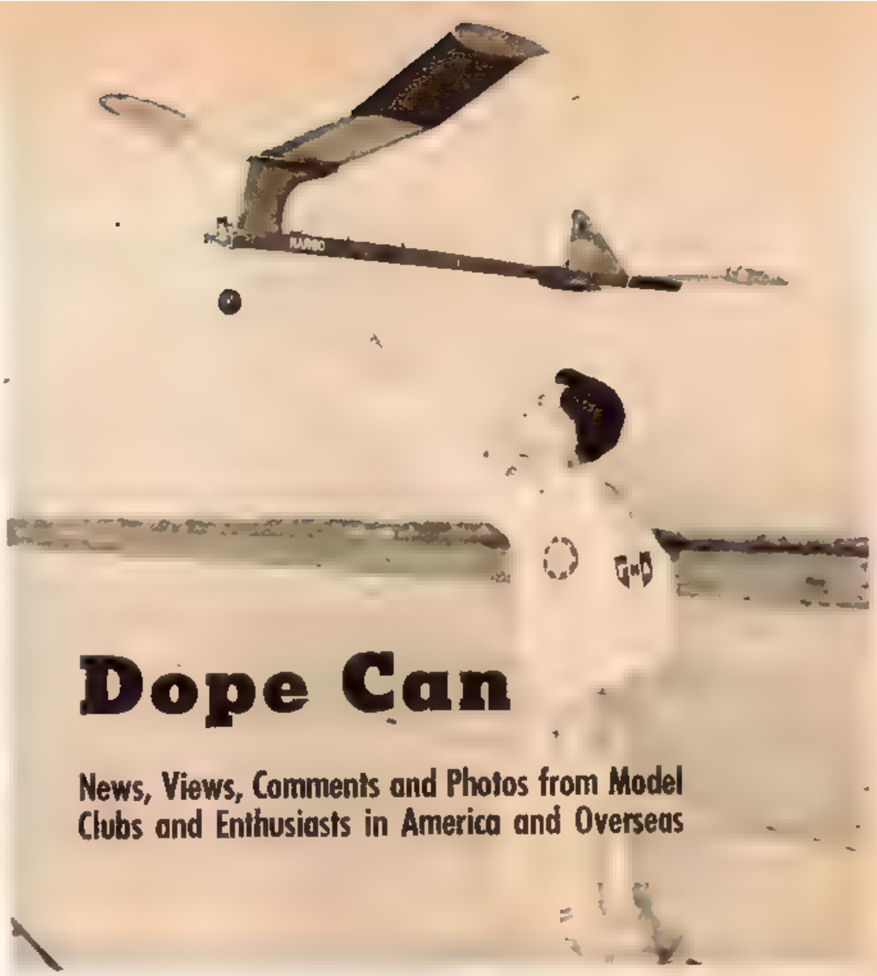
The actual construction is really elementary. The model shown took two hours to build and cost me about a dollar for everything but the dopes. Of course, a Jetex 100 or 200 motor is an additional investment, but you won't fly it out of sight.

Starting with the wings and tail, glue together two pieces of one-quarter-inch by three-inch soft or medium-hard balsa planks in the length desired in order to be able to cut out the triangles economically. Be sure to have the grain running away from the fuselage. When the glue is thoroughly dry, cut to size and proceed to shape the leading and trailing edges from a high point close to the fuselage. Use a sanding block for this operation in order to keep the knife edge straight. Run a pencil line down the middle of the edges of the blocks first to avoid a wavy leading or trailing edge.

These three units can now be given two coats of clear dope, sanding between coats, and then put aside until the fuselage is finished.

Spot-glue together the two ¾" x 1½" x 10½" soft balsa blocks for the body. (*Continued on page* 73)





Dope Can

News, Views, Comments and Photos from Model Clubs and Enthusiasts in America and Overseas

Jose Manuel Tellez, captain of Mexican team, checks his entry in Tangerine International meet at Orlando, Fla. His plane, Mambo, flew o.o.s. day before meet, unseen since.

■ A surprising feature of postwar modeling is the great change prefabrication has produced. Prior to the '40's there were a lot fewer modelers, but for the most part they were more skilled than today's crop. It's pretty evident that more engines and more kits were sold last year than ever before, but startling design advances were limited.

Some of the old-timers in the activity will deplore this change. But we don't. Granted that you no longer have to be a genius to build and fly the average model. The fact that more models are completed and get into the air we find significant. According to National Meet attendance statistics, there are as many "experts" today as ever before, so activity is not dropping off in that department. But where it does show up apparently is in the formal club programs. With prefabrication and glow plug engines the newcomer can glue a model together in an evening, hook up the lines or set the dethermalizer the next morning and be in business.

This means fewer modelers are dependent upon clubs for assistance and guidance. There is a lot more "solo" flying along the model airways than ever before. Less organized flying has an effect on club programs and memberships. We can give you an example.

Down at Aliquippa, Pa., the *Knucklebusters* club has everything that you figure a successful club needs—a meeting place (every Wednesday evening in the basement of the Sheffield Junior High School), a sponsor (the local Exchange Club), even power tools available. Yet, like many another model aero club, the group faces a big problem in hanging onto members during the winter months. The *Knucklebusters* got underway in May '50 with about 23 members. Everything went fine until September when school started. By February the active membership was down to 10. What's to do? Stanley Lake, the club's veep, puts the question to us.

Stan, running any type of club and keep- (*Continued on page* 79)

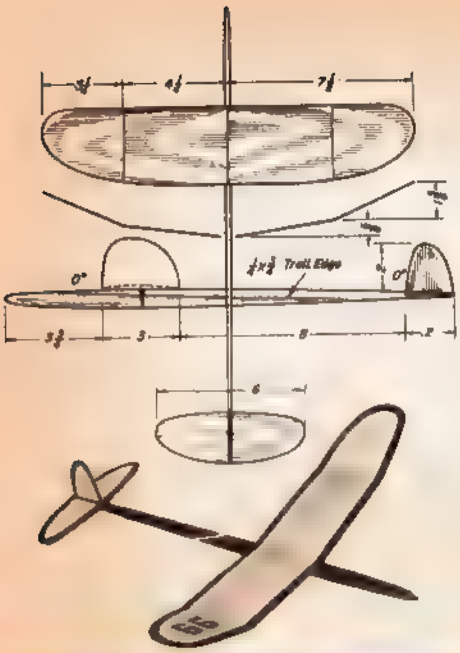
With white blotter for concrete and picture for background, Stuart Bartlett produced this shot of Charles Bedolla's Thunderbolt.

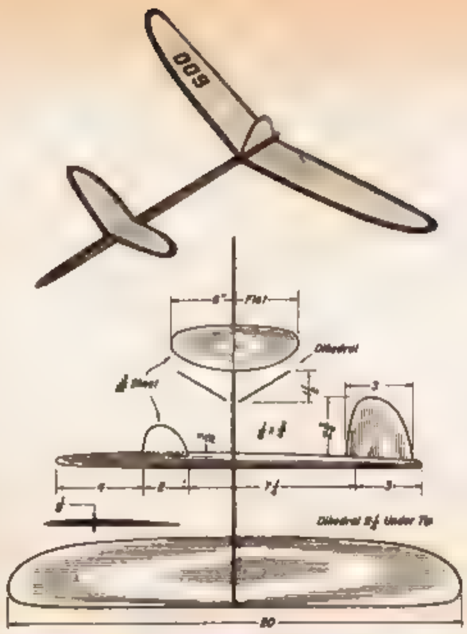
Air Trails pays $5. per for photos used in Dope Can

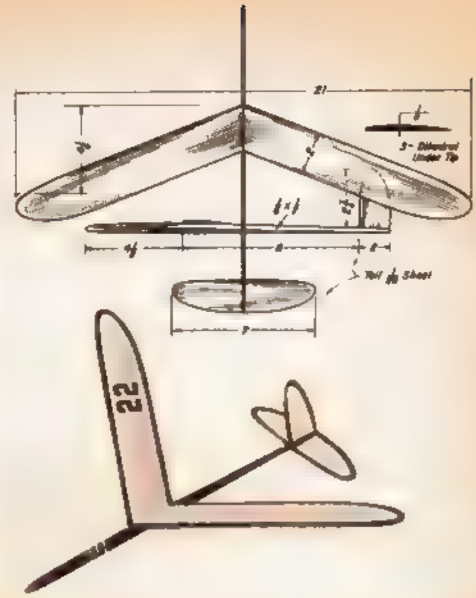
Hard to believe this from a 50c kit! Comet made kit, Al Cassell of Phila. built model. Planked with 1/16" balsa; sold for $11.

New-rule Wakefield by R. J. Dunham, Tulsa, Okla. Elevator: 82 sq. in.; wing: 212 sq. in. Plates on stab ends to eliminate tip loss.

Winner of flying scale contest in England was J. Bridgewood's steady flying Dornier 24. E.D. Bee mounted in center cowling.







Air-Model Design Competition:

AT's "A-M-D" Contest

You are not required to build a model in this contest! All you do is submit detailed 3-view drawings of your favorite "brain-child." These should be not less than 8 by 10 inches and must contain information on wing areas, spans, fuselage length, center of gravity, weights, power used and the like. AT will select 8 outstanding designs to be presented in 3-view form. Payment of $5 will be made for each one published. The top design in each special category will be built and test-flown by AT's design research team; upon completion of the tests the model will be given to the winner. The category until May 1, is .19-.35 stunt models; until June 1, Half-A Speed.

■ Be you a newcomer or an old-timer, balsa gliders will give you most fun for your time and money. About a half hour of work, and you can be out there, hunting for thermals.

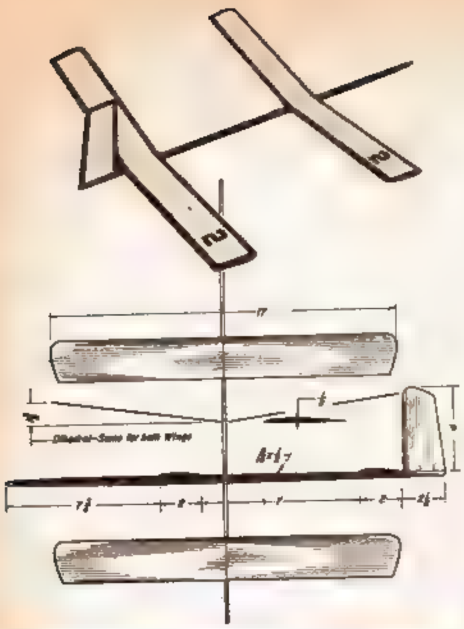
Some might say that power ships get up much higher than gliders. Have you ever tried a true catapult glider? Using 20 strands of ¼" wide and 60" long rubber, you will need some sort of smoke indicator to show the glider's path and its position when it gets up there. It just about disappears from sight. There are many ways in which you can duplicate power model performance with gliders.

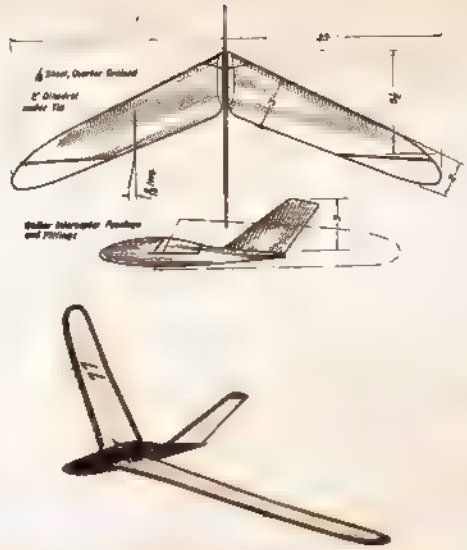
And a field which has not even been touched by the model builders is the building of scale gliders of proposed models. As long as the C.G. on the scale glider is in a similar location as the C G. on the finished power model, the flight characteristics will be similar. The angular setting of the wing and stabilizer will thus be automatically determined on the scale glider, although the airfoil may not be similar. This may work out for glide conditions, you may say. How about power? Very simple; just launch it at a higher speed. And to duplicate the torque, place clay weight on left wing tip.

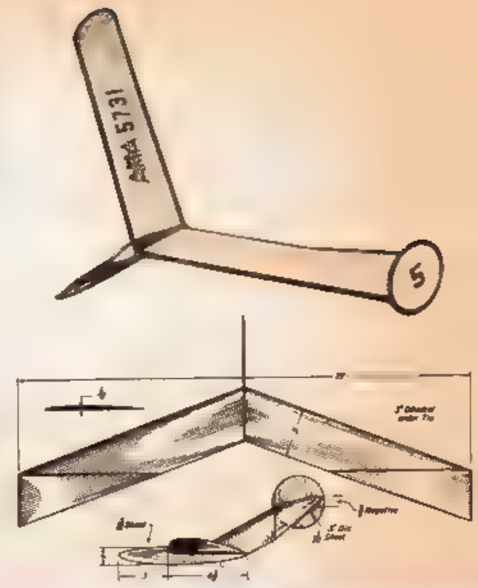
Shown here are nine glider variations representing practically every known configuration for balanced flight. By trying them, you may get an idea what to expect from each type. You will find that you can launch the standard 0-0 design (wing set at zero, stab set at zero) and it will take all the power you can concentrate on your fingertips. But try the same thing on the flying wing model, and you'll quickly see the difference. While 0-0 will climb like a rocket, the flying wing will shed wings or loop several times. Right here sense the lesson: if you are planning a flying wing, do not use as much power on it as you would on an 0-0 design.

The history of the contest of hand-launched gliders goes back to around 1927; a 17-second flight was practically a record, and many contests were won with time even lower than this. As the model building and flying movement became geared to the general aviation upheaval after Lindbergh's flight, the glider event was one of the most popular features of the day. And so, by sheer number, the design of the hand-launched glider gradually began to change until now we have the long moment arm and the 0-0 setting.

What really gave the hand-launched glider a major boost was the development of the basic launching procedure. The pre-1927 system was to hurl the glider into the air somehow and hope for the best. The New York Aeronuts did probably more than any other group to develop the basic







Balsa Gliders

Here's most unique contest in aeromodeling; you don't have to build a model to enter—amazing, no?

launching technique. The idea was to have left turn adjustments on the glider, and then launch it into a right turn. This allowed a powerful side arm throw. By holding the model almost vertically, the initial high speed was dissipated in a climbing right turn instead of a loop. The left turn adjustment tended to open up the right turn, and so produced a safe climbing condition instead of spiral dive Once the model reached the peak of the momentum, the left turn setting took over.

In the early days thermal flights were rare because we did not get the gliders high enough. So, any kind of a system that would get the models higher, helped in raising the records. The "sidearm" launching system helped us attain altitude, and it is still used, in a modified form.

In the early days we tried all sorts of wing and stabilizer layouts, looking for something that would work better than what we had. Any time a certain design showed a promise, it was thoroughly explored. Some tried the canard type. This type of model had a very flat glide when launched gently, but it could not be thrown high without rolling into a spiral. It had too much looping action. Thus, the initial inertia was not converted efficiently into height. Any model having angular difference between wing and stabilizer will differ under power and in a glide. The glide may be smooth, but power may produce looping.

At one time the tandem glider was seen more often than now. But that was when contest times were not so high. Two wings seem to offer more lifting area. But the model itself does not lend itself to high power. Perhaps too much total drag, or some other aerodynamical condition. Also, it required fairly large circles. It would tend to spiral-in on small-circle adjustments. Therefore, a tandem may give you fairly decent time in a calm weather. But for thermal flying, a tight circle glider is needed.

The first real thermal hunter was the sweepback glider developed by the New York Aeronuts. Using the side launch, this glider gained about 30 feet. But it was capable of very tight turns, and thus picked up whatever ground thermals may have been around. Now that we know more about model aerodynamics, we can more or less analyze this design.

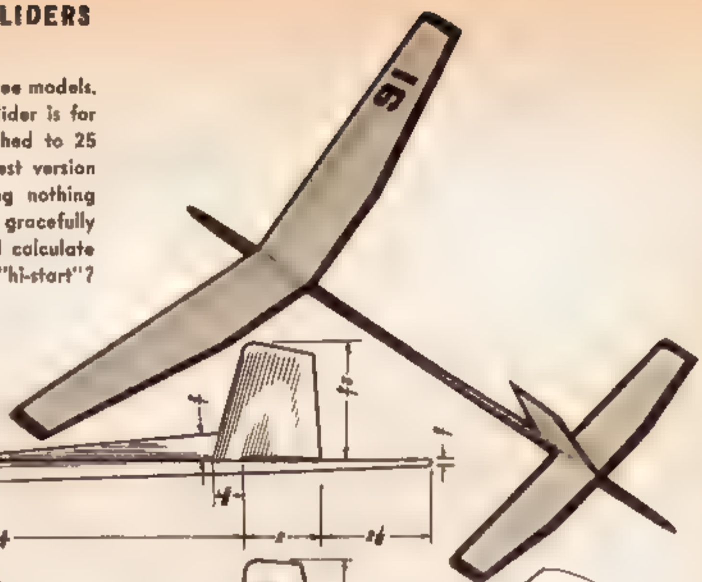
At that time we gave the sweepback the credit for this tight circling characteristic. Why we had the impression, we do not know. What the sweepback actually did was to make the model very short coupled. This short coupling, and using angular difference between wing and the stabilizer, are a perfect set-up for tight turning. The glider retains a certain amount of stability in the circle, and it is not sensitive to upsets. But this design is not recommended for modern contest flying. What can you do with 30 feet?

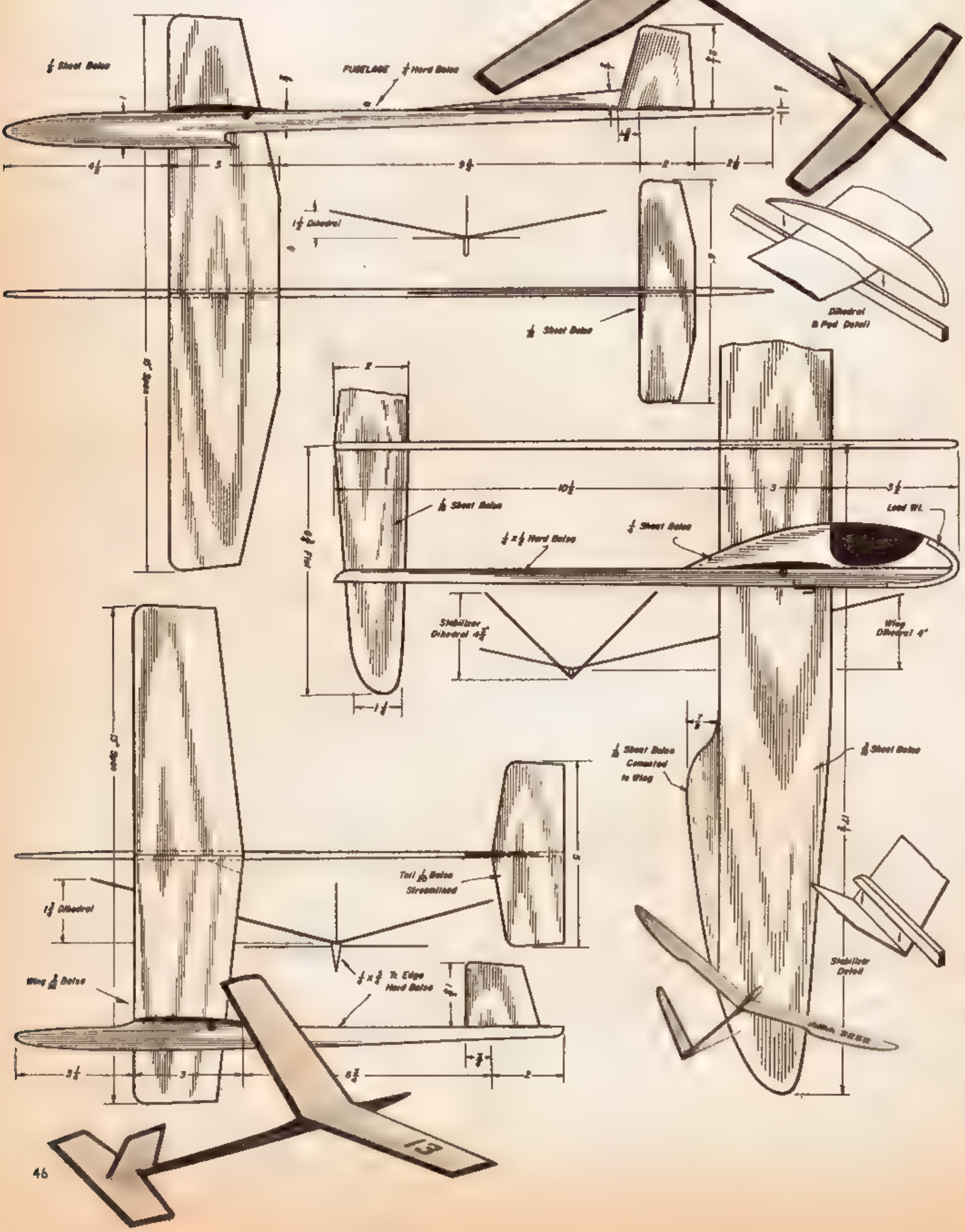
Flying wing gliders always intrigued the model builder. If you have a slope in the back yard, try a flying wing while a gentle breeze is blowing. The trick is to find a wing which will just rise on the slope wind. The flying wing definitely cannot take any kind of accelerated launching. That is, unless we can somehow fold its wing.

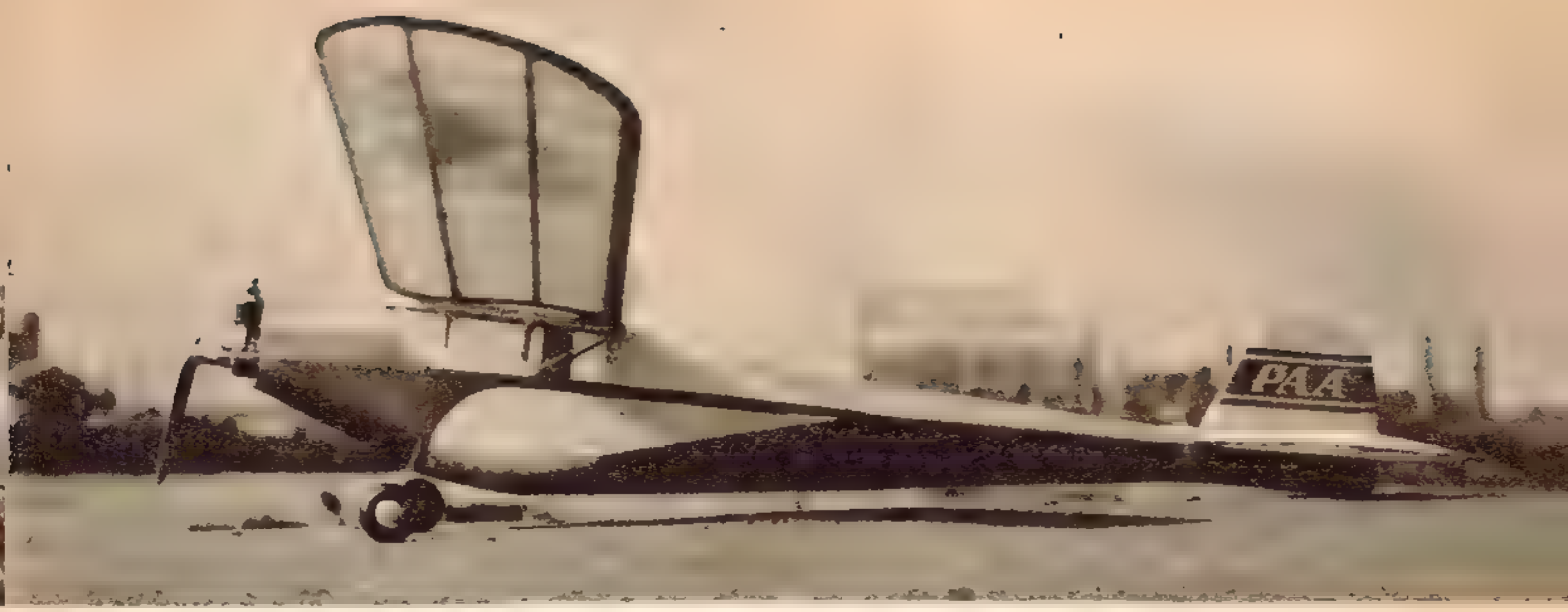
It is surprising that so many model builders by-pass Jim Walker's folding wing mechanism without giving it a try on their own design. A flying wing version is shown. (*Continued on page* 74)

AIR-MODEL DESIGN COMPETITION: BALSA GLIDERS

The ultimate in all-balsa glider design is represented by these three models. Top design is for a high-performance catapult glider; center glider is for towline or "high-start" operation (75 feet of kite string attached to 25 feet of two-strand 1/8" wide rubber); bottom 3-view is the latest version of the old and faithful hand-launched glider. For sport flying nothing provides greater pleasure than the high-start glider which swoops gracefully into the air giving you an opportunity to observe its flight and calculate what further flight adjustments may be necessary. Why not try "hi-start"?

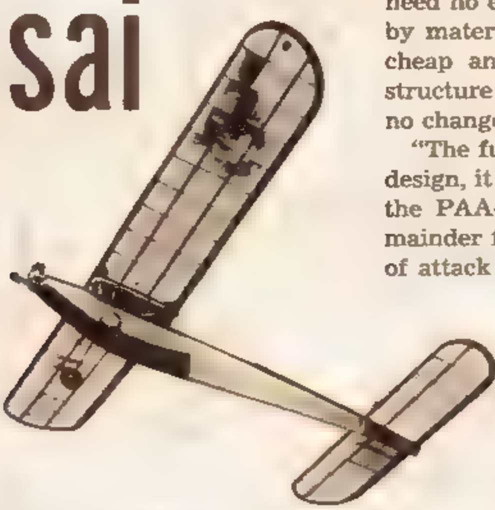






The first *Clipper Chisai* built by the Iwata Brothers in Tokyo; *Chisai* is the English pronunciation of the Japanese characters meaning "tiny."

Clipper Chisai



By DALLAS B. SHERMAN

From far-off Tokyo comes a new contender for PAA-LOAD honors designed by the man who originated Pan American World Airways' model event

■ When word filtered through from Tokyo that Dallas B. Sherman, the poppa of Pan American World Airway's PAA-Load event, had designed a model for the '51 payload competitions, great interest was evidenced over what "ole DB" had produced.

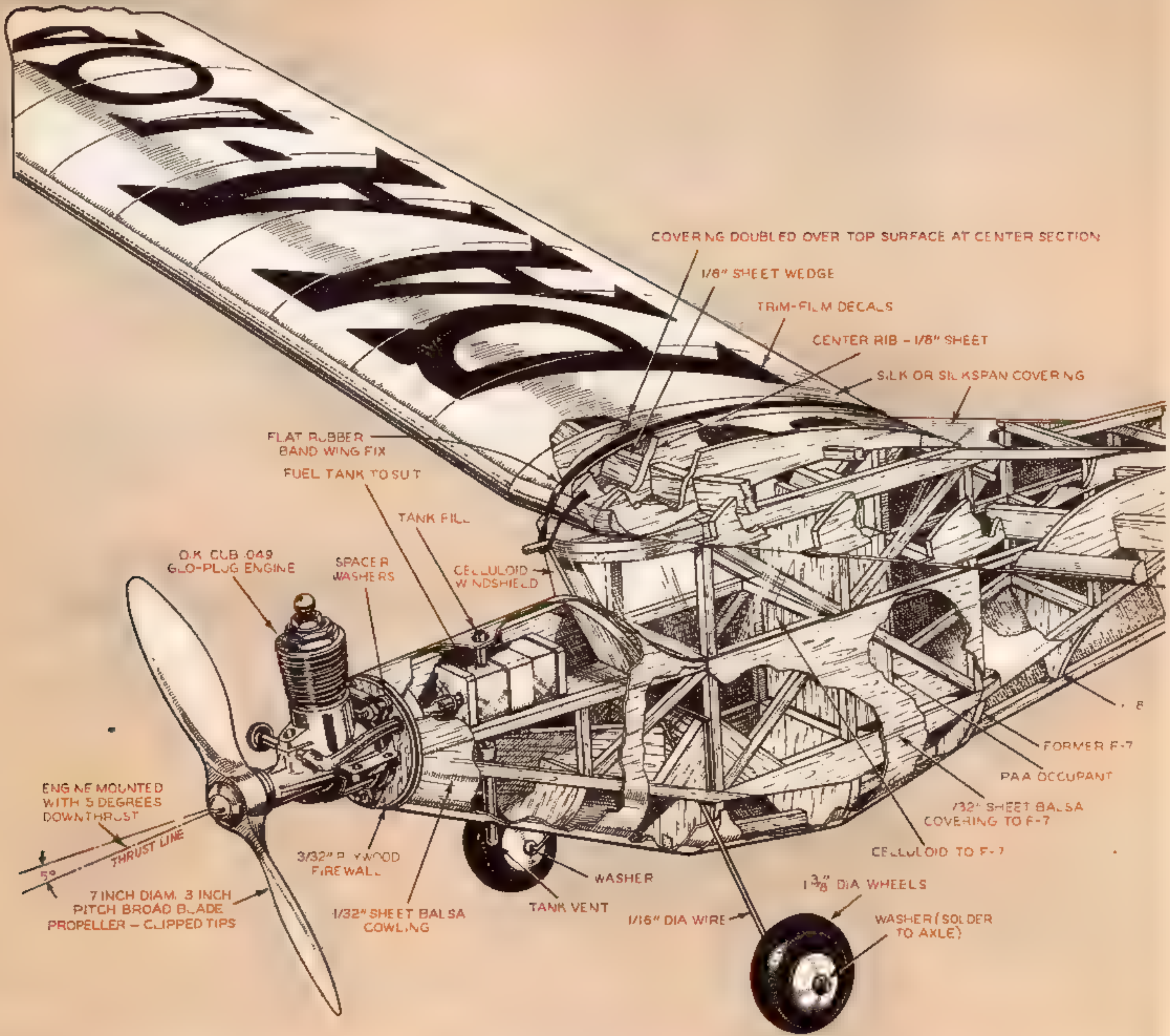
Here is the outstanding PAA-Load design by the man who dreamed up the event. It has been successfully flown by various Japanese modelers and comes in time to make the U.S. meets this summer. Mr. Sherman's own comments on the model follow:

"Wing, stabilizer, and rudder are entirely conventional and need no explanation beyond the drawings. They may be covered by materials at the builder's option. We used silk because it is cheap and plentiful in Japan, and adds strength. The frame structure is strong enough to take it. Test flights have indicated no changes at all that should be made in these surfaces.

"The fuselage is a little different from the run-of-the-mill. In design, it is an attempt to get the rectangular section required for the PAA-Load 'occupant' and at the same time 'fade' the remainder fuselage into a shape more streamline at the high angles of attack at which the model actually flies. It is assumed that a free-flight model in competition never actually flies 'level' and therefore 'straight line' streamlining is of little or no real merit. More effective 'climb and glide' streamlining of the fuselage is theoretically possible, but here we compromised for structural simplicity and lightness plus a deepened belly to assist in anti-spiral characteristics.

"In building, construct the crutch first. Leave the crutch on the working surface and build on the *bottom* of the fuselage inverted. The top of the cabin may be built separately and glued on as a unit. Then fill in the top fuselage structure from cabin back to front of stabilizer position. Note that the landing gear is installed while fuselage is being built in order that the lower center nose brace may be attached to the landing gear plywood mount.

"A desirable refinement is to trim all of the intermediate triangular bulkheads to concave shape; this gives a more pleasing cover appearance by preventing the cover from sticking to the bulkheads and also cuts some structural weight. Silk covering is recommended for the fuselage because (*Continued on next page*)



of the curved-to-flat transitions involved and also for strengthening purposes.

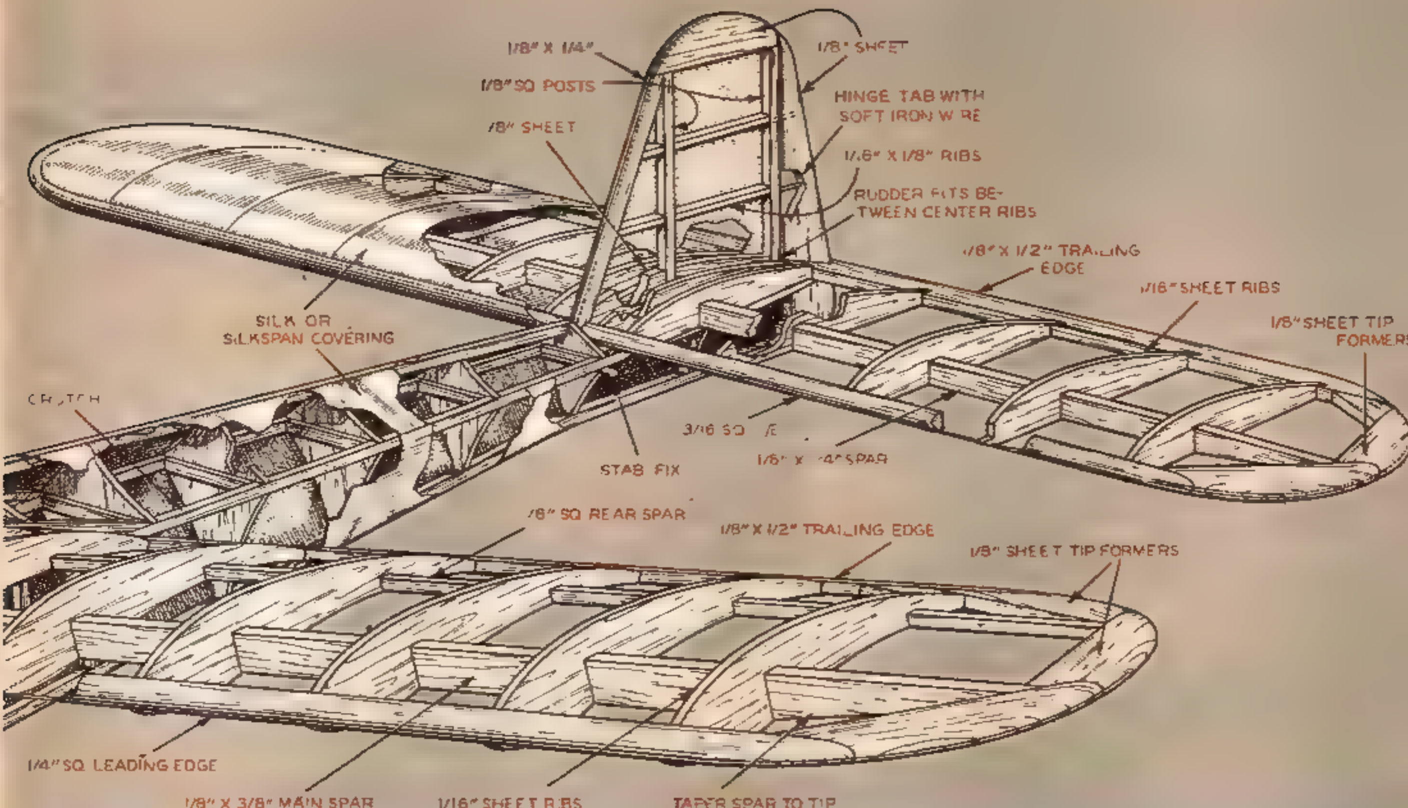
"The 'paper or thin wood' covered sections at front of fuselage were actually covered on the test model with 1/20" balsa sheet, which has proved satisfactory. Other fuselage details and procedures are routine practice. As expected, the crutch is sufficiently wide at the rear so that no stabilizer rest as such is required.

"Decoration as shown on the drawings and photos is quite attractive and, together with the overall lines of the model, gives a most realistic appearance both at rest and in flight. It is pleasing to note spectators referring to the *Clipper Chisai* as 'that little airplane' instead of 'that model.' Generous hot fuel proofing is recommended.

"The test model uses standard OK Cub .049 glowplug engine. No timer was employed, the engine run being determined by clocking full tank and releasing for flight with the desired number of seconds yet to go. (For tests in the small fields of Japan, we use 15 seconds R.O.G.; a larger tank would be required for the U.S. standard 20-second run). Propeller is a 7-inch-diameter, 3-inch-pitch broad blade type, with tips trimmed down about 3/8 inch each.

"Testing should be in four phases: (1) glide without payload (2) glide with payload; (3) power without payload; (4) power with payload. Being a little prejudiced in favor of payload, I skipped phase (3)

(1) *Glide without payload.* This is to *determine* proper C.G. location for best glide possible without any stalling tendencies and to *check* for proper alignment of all surfaces. The test model was slightly nose heavy for best glide without payload, so weight was strapped to top of fuselage at front of stabilizer. Individual models will vary slightly in best C.G. location; on the test model it falls a bit in front of the rear spar. The built-in wing incidence (4 degrees) and stabilizer incidence (zero degrees)

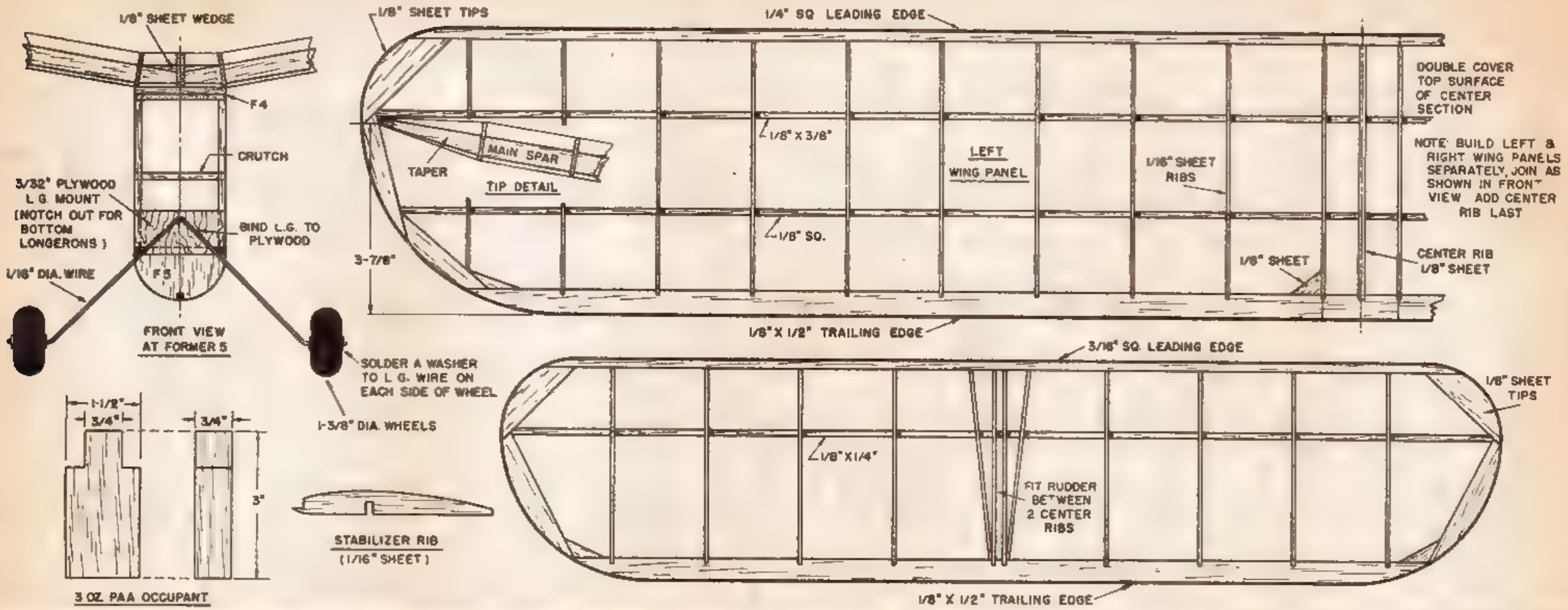


were O.K. on the test model, but these settings also may vary in other individual models.

"(2) *Glide with payload.* This is a little tricky and should not be rushed. The payload occupant should be placed temporarily (but firmly!) in position that will hold C.G. at position previously determined. A satisfactory method is to use two pinpoints projecting about ⅜ inch from bottom of occupant so that he can be firmly pinned to the floor, then wedge him in about the shoulders with scrap balsa and secure the whole works in place with a rubber band. Remember, if he slips some damage is almost sure to result. Remember also that wing loading has gone up with the occupant aboard and this calls for higher gliding speed, so the old heave-ho must have more zip.

"Be sure the nose is pointed level or slightly below when you turn loose. The landing will be faster with payload aboard. It's pitiful how many props are busted (and even engines knocked out!) in glide testing when the propeller rotates to vertical position and is therefore the first thing to hit. A simple solution is to loop a rubber band around each prop blade and back of the cylinder to hold the prop in a horizontal position. Glide-test with payload until the best glide possible is obtained (this may call for incidence adjustments in wing or stabilizer on individual models) with just the least indications of a steady left turn.

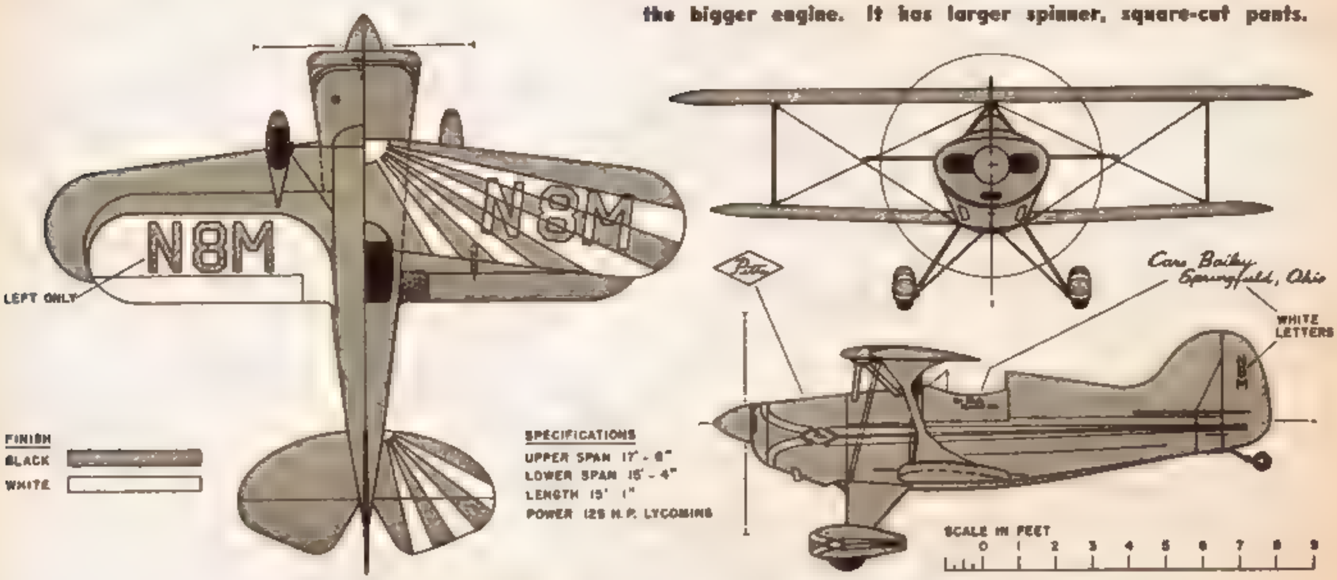
"(3) *Power without payload.* Sorry, no tests have been run in this category. (*Continued on page 76*)


1/8" SHEET WEDGE
F4
CRUTCH
3/32" PLYWOOD L.G. MOUNT (NOTCH OUT FOR BOTTOM LONGERONS)
BIND L.G. TO PLYWOOD
1/16" DIA. WIRE
F5
FRONT VIEW AT FORMER 5
SOLDER A WASHER TO L.G. WIRE ON EACH SIDE OF WHEEL
1-3/8" DIA. WHEELS
1-1/2"
3/4"
3/4"
3"
3 OZ. PAA OCCUPANT
STABILIZER RIB (1/16" SHEET)
1/8" SHEET TIPS
1/4" SQ. LEADING EDGE
TAPER
MAIN SPAR
TIP DETAIL
3-7/8"
1/8" X 3/8"
1/8" SQ.
LEFT WING PANEL
1/16" SHEET RIBS
1/8" SHEET
DOUBLE COVER TOP SURFACE OF CENTER SECTION
NOTE: BUILD LEFT & RIGHT WING PANELS SEPARATELY, JOIN AS SHOWN IN FRONT VIEW. ADD CENTER RIB LAST
CENTER RIB 1/8" SHEET
1/8" X 1/2" TRAILING EDGE
3/16" SQ. LEADING EDGE
1/8" SHEET TIPS
1/8" X 1/4"
FIT RUDDER BETWEEN 2 CENTER RIBS
1/8" X 1/2" TRAILING EDGE

CARO BAYLEY'S

Pitts Special

This is the little Pitts with which Caro Bayley took third place in the 1951 aerobatic contest at Miami, Fla. For those who want to build a control liner of the wee beauty, it is basically the same plane as the Pitts-Skelton Bipe (AT Sept. 1950) with these changes: span increased by 6 in., length by 11.5 in. due to the bigger engine. It has larger spinner, square-cut pants.



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Prof. Phugoid and His Contribution to Modeling PART II

By WM. F. McCOMBS

In the first section of this report, we covered the adjustment of rubber-powered models by a method developed by the author (an aeronautical engineer at McDonnell Aircraft) working with fellow members of the Kirkwood, Mo., Thermaleers club. Now we go on to adjustment of gas engine powered model planes.

■ On most gas models, particularly the pylon type, the wing cannot be easily shifted, and therefore the correction is made by adding weight to the nose or tail depending on which is necessary. It is very easy to erase any tendency of a "hot" gas job to loop under power simply by adding just enough weight to the tail and retrimming for a good glide. Of course, this should be done carefully, adding just enough weight each time to shift the center of gravity about a quarter of an inch to the rear.

When the engine cannot be run slowly for test flights, it is best to use short motor runs of five seconds or so, since this is quite long enough to notice any bad effects and lessens the chance of the model "winding in" under power. When the flights appear to be all right the motor run can be lengthened.

When the proper wing position has been located, the modeler can proceed to put whatever turn he thinks best into the model for circling flights. Circle in the glide is achieved by using a trim tab on the vertical fin or by offsetting the entire empennage (fin and stabilizer), if this unit can be adjusted easily. More consistent and less troublesome results can usually be secured by offsetting the empennage rather than by using a tab which some spectator can twist so easily and unnoticeably.

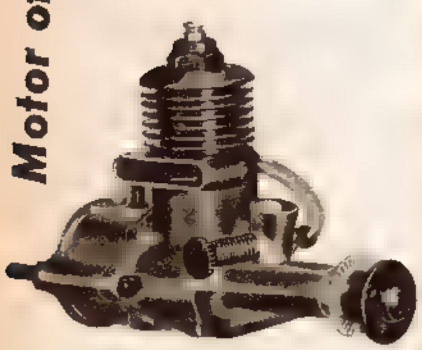
When one is putting turn into a model he should proceed carefully using very small adjustments; otherwise there is great chance of getting spiral dives. It should be pointed out that a model which glides nicely in a straight line or very large circle will most certainly spiral-dive into the ground if a considerably sharper turn or circle is put into the adjustments. This is easily prevented simply by decreasing the angle of incidence of the stabilizer slightly, that is, by raising the trailing edge or by lowering the leading edge.

Sometimes the amount of turn put in for the glide will be sufficient for the flight under power, but most often it will not. Turn adjustments under power are made by offsetting the thrust line of the model, or the shaft of the engine, to the right or left. Suppose a model on which the wing or center of gravity has been properly located appears to have a very pretty right turn in the glide but tends to spiral in to the right under power. This trouble is corrected by offsetting the thrust line slightly to the left.

Some modelers prefer to have their ships climb and glide in opposite directions. This is largely a matter of personal preference, the important thing being to use the vertical fin setting for regulating turn in the glide and the thrust line offset for regulating turn under power. For most high-wing ships it is usually easiest and safest to circle to the right under power.

Now it is true that the nose-up effect under power can be decreased by the use of excessive downthrust —by offsetting the thrust (*Continued on page* 70)

Motor of the Month



Baby Mac

Much interest will be focused on this latest Duro-Matic powerplant

■ Duro-Matic Products has added a new member to their family of engines, the *Baby Mac*. Like other McCoys this new Half-A has a red cylinder head and the characteristic square crankcase

One of the many interesting features is a combination built-in fuel tank and radial engine mount. The front section of the tank fits into the back of the engine and is notched top and bottom so the tank can be installed in an upright position whether the engine is mounted inverted or upright. Most small engines on the market have 360° exhaust slots that blow oil and exhaust gas in all directions, but this condition is overcome on the *Baby Mac* by an exhaust stack similar to those on larger engines. This is a very desirable feature for models with a complete engine cowling. The *Baby Mac* is sold in packaged form with a propeller, fuel tank, cylinder head wrench, mounting bolts, and fuel line.

The engine tests show that performance is best in the medium and high speed range and this points to control line sport, stunt, and speed applications. Continuous operation at 14,000 rpm showed no ill effects on the main bearing or any other part in the engine. When using this engine in free flight ships, don't select too large a propeller. Changing from a 6/3 to a 6/4 propeller during tests showed some loss of power. Best results should be obtained with a 6/3 propeller that will allow the engine to run at 11,000 rpm or more on the ground. During the engine tests the tank was timed at 1¼ minutes with a *Baby Mac* propeller. This is adequate for starting and adjusting the engine before you make that all-important launch.

Engine break-in was started with a *Baby Mac* propeller. The engine immediately hit 11,000 rpm and went up to 12,200 rpm within five minutes In getting engine started for the first run the compression ratio was rather high and, with a tight-fitting piston, the engine tended to fire too far ahead of top dead center and kick back or oscillate, so a light prime of fuel was used in the exhaust. After five minutes' running, the piston became loose enough to make starting easier. The engine would kick off quickly when it was quite wet.

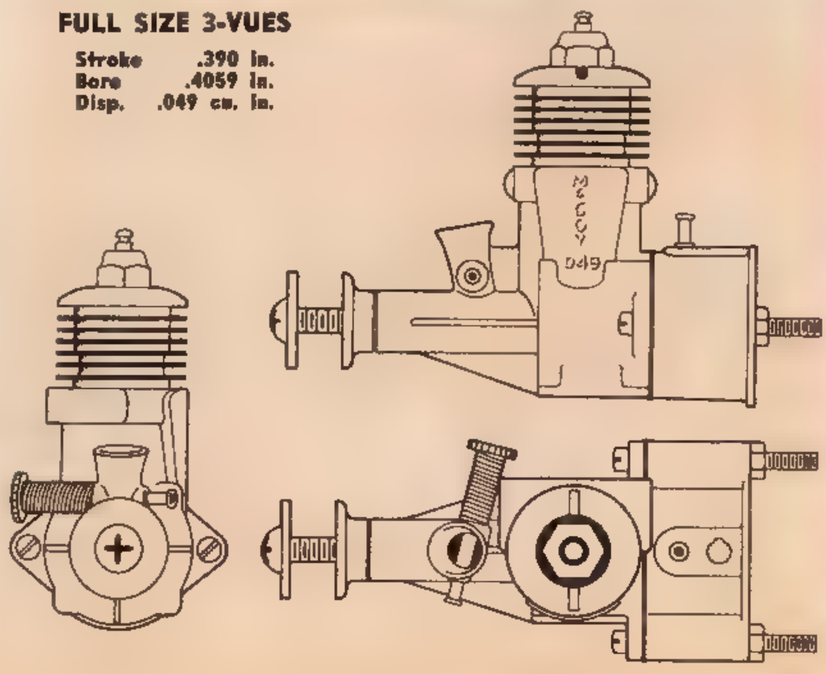
After five minutes of running on a *Baby Mac* propeller, the engine appeared to be fully broken, but it was allowed to run for half an hour before starting rpm checks. A 6/3 propeller produced excellent results in starting. Speeds between 12,000 and 13,500 rpm delivered best power and resulted in smooth operation. The engine ran very steady at 14,300 rpm.

Changing from a cold fuel mixture to the hotter Half-A blends produced only a slight increase in rmp, but the fuel level test increased from five inches to seven inches.

(Continued on page 62)

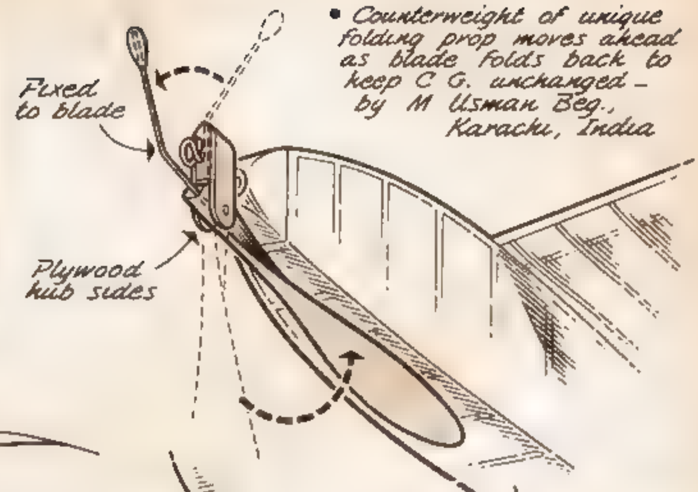
FULL SIZE 3-VUES

Stroke	**.390 in.**
Bore	**.4059 in.**
Disp.	**.049 cu. in.**

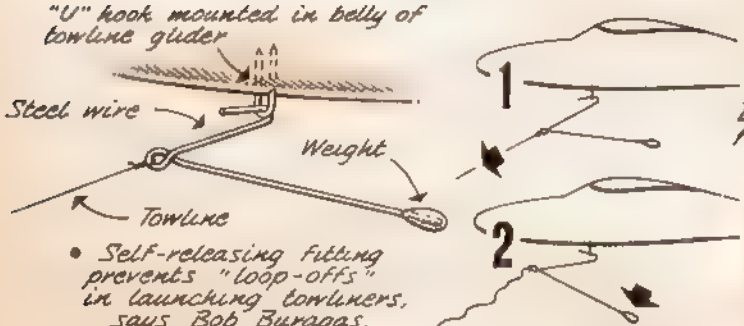


sketchbook

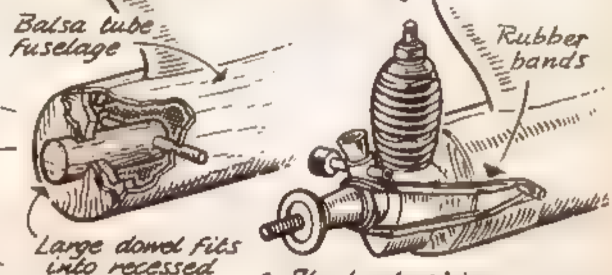
Have you developed something new in construction, control, or flying that might interest other modelers? Send a rough sketch—we'll redraw it and pay $5 for each one accepted. Due to their large number, we're sorry that we cannot acknowledge or return submissions.



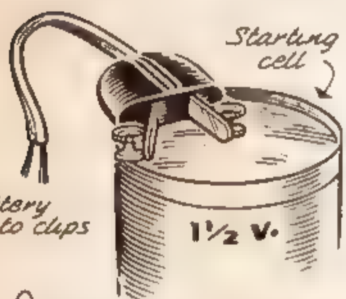
• Counterweight of unique folding prop moves ahead as blade folds back to keep C G. unchanged — by M Usman Beg., Karachi, India



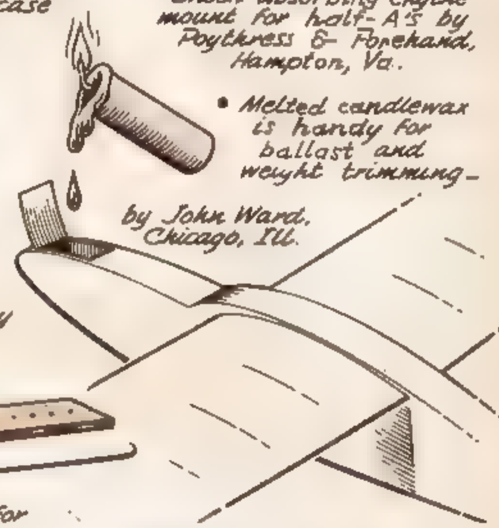
• Self-releasing fitting prevents "loop-offs" in launching towliners, says Bob Buragas, E Orange, N.J



• Shock-absorbing engine mount for half-A's by Poythress & Forehand, Hampton, Va.

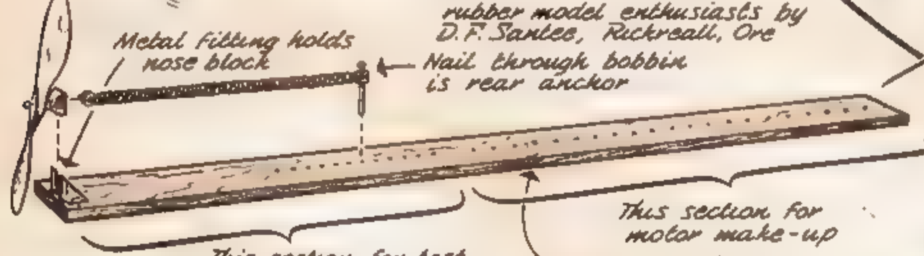


• Ordinary receptacle plug with prongs bent apart, makes quick booster battery connection — Larry Johnson, Manchester, Ct.

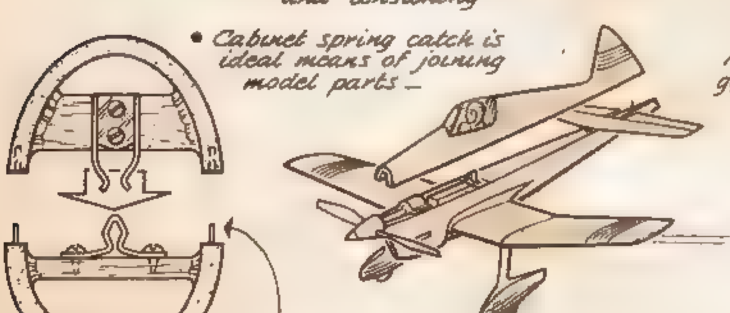


• Melted candlewax is handy for ballast and weight trimming — by John Ward, Chicago, Ill.

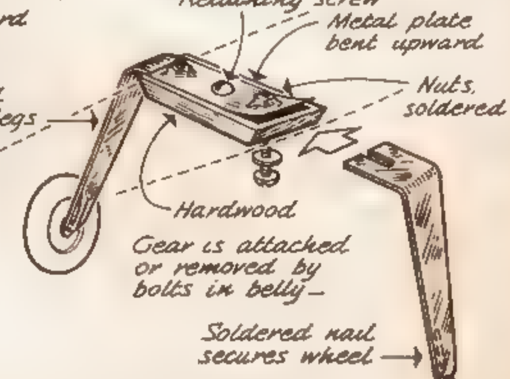
• Test stand for serious rubber model enthusiasts by D.F. Santee, Rickreall, Ore



• Cabinet spring catch is ideal means of joining model parts —



Alignment pegs assure accurate assembly — Submitted by L A Bly, Jr., Orangeburg, S.C.



• Quick-attachable gear by Wm. Kupka, Chelsea, Iowa

Russia

(Continued from page 22)

of comparable U. S. or British axials.

The problems of reducing engine weights and fuel consumptions of their axial units, and of increasing reliability and operational life, are giving Soviet technicians considerable headaches, despite the assistance they are receiving from German technicians, and this fact lends credence to the numerous reports that Russia is producing a centrifugal unit based on the Rolls-Royce Nene. Such a unit would be exceptionally attractive to the Russians due to its greater inherent simplicity and less complex production problems as compared with the erstwhile German axials, and the examples of this unit acquired by the Russians have no doubt given Soviet technicians a wonderful start in the centrifugal field.

Logically, therefore, the Russians are presumably developing centrifugal units alongside their more long-term axials, and although not officially confirmed, such centrifugal units may be used by several of the latest Soviet jet fighters. The question of the type of turbo-jet installed in the much-publicized MiG-15 fighter is still unresolved. Many reports indicate that a centrifugal compressor type unit is employed, whereas some claim that the use of a nose intake is indicative of an axial unit. The latter school of thought bases its argument on the fact that centrifugal units such as the Nene with double-sided impeller, require a plenum chamber to supply sufficient air to both sides of the impeller, and nose entries afford many problems when applied to this type of engine, unless the intake is close to the turbo-jet. Consequently, side intakes are almost universal for Nene-powered fighters.

However, it should be borne in mind that among notable exceptions to this general rule are, of course, the successful French Dassault MD 450 Ouragan and Kurt Tank's Pulqui II, currently under test in Argentina, both of which combine a nose intake and a Nene centrifugal unit.

In the field of rocket powerplants, the Russians had several experts of their own whose efforts before the war were largely ignored. These are now being given greater freedom of action, aided by German engineers and a mass of German research data acquired after 1945. A good deal of experimental work on rockets, pulse-jets and ram-jets is going on, although the only application which appears to be approaching practical form is that of the rocket-powered "target-defense" interceptor. It is known that the Junkers Ju 8-248 (or Me 8-263—an improved version of the Me 163 Schwalbe) is being developed in the Soviet Union, and it is ironic that the plant producing the Walter HWK 509C rocket unit to power this machine, at one time at Kiel, was moved to Prague (now well inside the Iron Curtain) to avoid Anglo-American bombing.

Experimental rocket research centers have been established at Irkutsk, Kuibischev, and other places, where the German missiles that were still in an unfinished state at the end of the war are now being brought to operational status. How far the Reds have been able to develop guided missiles in the last five years is problematical. Under the guidance of TsAGI, the Russians have produced their own versions of the Hs 298 and V 3 anti-aircraft and Hs 293 anti-shipping missiles, and we can rest assured that the Soviet will persevere in finding the solutions to the many problems associated with such weapons.

In the aircraft armament sphere, as with jet engines, the Russians inherited some very advanced work from the Germans, especially in the branch of research dealing with weapons for defense against attacking bombers. Russian tanks, artillery and small arms are acknowledged to be among the

most efficient in the world, and Russian aircraft armament reflects the same high standard in detail, but there are unfilled gaps in the Soviet air arsenal.

Russian fighters have for some time past used larger caliber cannon than the standard weapons of the USAF and RAF; there are signs that 30-mm is the smallest caliber gun now considered by the Reds to be suitable for main fighter armament. Newer Russian aircraft guns owe much to German wartime experience, and the Mauser MG.213/C/30 of 30-mm caliber, which represented the peak achievement in German aircraft gun design, has been adapted for Russian production. This gun has, as yet, no equal in the world—the German version had the remarkable rate of fire of 1,100 30-mm shells per minute. Another gun in which the Russians evinced much interest was the 50-mm MK.214A, but, irrespective of whether the guns installed in the latest Russian fighters are of purely national design or of German origin, the fact remains that such machines as the MiG-15 and the La-17 definitely carry heavier and longer-ranging armament than USAF fighters of comparable type

For more than a decade the Russians have been noted for the general high standard of their armaments, and this high standard apparently holds good with regard to new weapons. As an instance of their unprejudiced approach to new aircraft armament we have only to cite their adaptation of army artillery rockets for aircraft use, evolving the "rocket bomb" quite early in the war. They have thus taken kindly to the air-to-air rockets of the German R.4/M type—as many as 48 of which were carried by the Nazis' Me 262 Sturmvogel fighter and used with startling success against Allied bomber formations in the closing stages of the war. Weight of fire seems to be emphasized just as much in a Soviet air regiment as it is in a Red Army infantry division.

We have little reason to suppose that Soviet scientists are hopelessly behind their U. S. contemporaries in theoretical and experimental work on the newer radio developments such as VHF and UHF, or indeed in the various applications of radar. But even if their wartime knowledge of these subjects *was* behind ours, the very sharp lesson taught by their brief and unspectacular efforts at strategic bombing underlined their need for intensive development of radio and radar navigational aids

It has been estimated that of the 100 to 150 Soviet night bombers which comprised a normal major assault on Berlin, Warsaw, Bucharest or Konigsberg in the 1943-45 period, less than 50% normally reached the target area and very often no more than 20 to 30 percent. This is not a reflection on the training or quality of Russian night bomber crews, but merely a statement of the inevitable limitations of a radarless bomber command operating at night. However, the Russians have obtained a wealth of radio and radar equipment from their erstwhile enemies and allies alike.

Firstly, during the war many types of British and American ground and airborne radio equipment were supplied as part of the aid to Russia program, while Soviet crews were trained in Britain in the use and maintenance of this equipment. A particularly valuable contribution was the supply of fifteen squadrons of Catalina flying-boats complete with the then latest anti-submarine and search radar. Later, full access was gained to the very considerable German advances in radar technique with its particular emphasis on radar interception and control of night fighter fleets. Russia's booty included most of the technicians, workers and equipment of the Telefunken and Siemens-Askania radio/radar plants, now working full out east of the Iron Curtain.

Perhaps surprisingly, this wealth of radar experience has not yet resulted in the extensive use of airborne equipment by the Soviet Air Force and commercial airlines as compared with their Western contemporaries. The aircraft of the State airline, AEROFLOT, still map-read their way about the Soviet Union and their crews receive no assistance from radar approach systems in bad visibility. Thus, both the Air Force and the commercial airlines are very much controlled by weather. The SAF is not an all-weather force as, say, the USAF understands the term. But in wartime, the threat of heavy casualties is hardly likely to deter the Russians from undertaking a vital air mission in bad weather and, to this extent, the present Russian lack of all-weather equipment is somewhat countered

Although Soviet radar is claimed as an achievement by Russian scientists, the whole theoretical and practical field is dominated by German technique. In particular night fighting tactics are modeled on the German pattern and on German equipment. It is known that an extensive radar air defense network does exist, and radar bombing techniques are believed to have been developed up to an operationally effective standard—though, in times of peace, the perfection of such equipment must needs take longer than during the accelerated development brought about by a full-scale war, and the value of Russian radar must, to a certain extent, remain an enigma until tested.

High performance aircraft have been flying in Russia for more than four years, during which time a host of new equipment problems have been encountered. Ejector seats, G-suits, heating, cooling and oxygen systems are items which Russia has had to develop almost from scratch, for at the end of the war, the Soviet fighter pilot's personal equipment was reduced to the essentials, as indeed was the plane he flew. This matter of personal gear raises the important side issue of pilot morale, and there is some evidence that equipment is improving. The ejector seat is now standard for latest high-speed single seaters, but G-suits and other "luxuries" are likely to be ignored until they become an absolute necessity for the efficient operation of the plane. Soviet pilots are tough, and expendable to an extent greater than elsewhere.

In a subsequent article we shall examine the basic organization and functions of the Soviet Air Force and Russian Naval aviation.

Air Adventurers

(Continued from page 34)

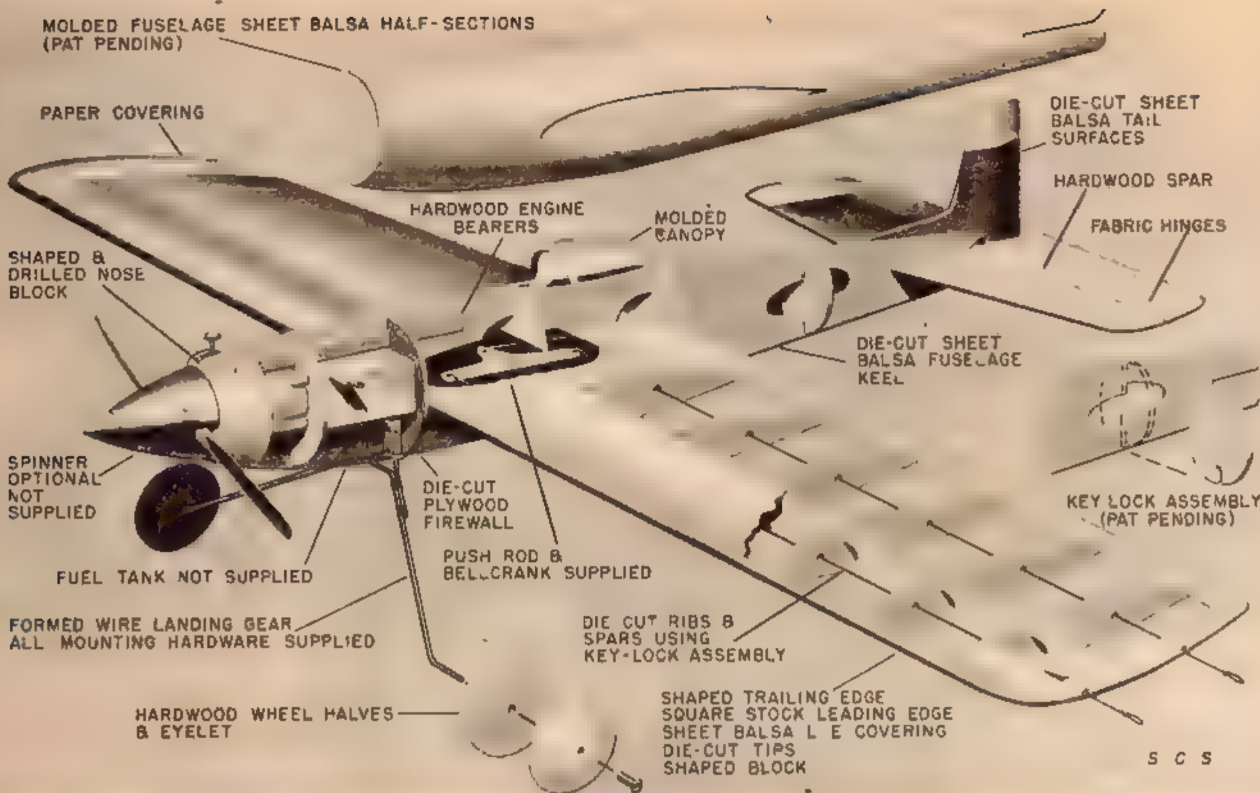
is a note of caution to those applying for membership. Fill out the application form *carefully*. Print neatly. Cut the coupon out along the dash-ed lines. You are not required to obtain a membership pin (we must admit, though, that they're very nice gold-plated affairs about ⅝" wide with safety pin back and the letters "AA" in blue enamel) You may obtain extra pins if you desire for 25c each

—Albert J. Carlson

A SEMI-CABIN MODEL

Now that followers of this series have built several types of gliders, and a very elementary powered model, we feel it is time to tackle a model that begins to resemble the real thing. Our design this month is what might be called a modified profile-cabin monoplane. The fuselage is a copy of that used on small private planes, if you view it from the side—it has a similar profile, in other words. For simplicity of construction, the fuselage is only wide enough to accommodate the rubber motor; however, the little ship is very realistic in appearance from most any angle, and is the logical step between the ultra-simple stick design of last month, and the full

(Continued on page 59)



Senior "19"

Testor-McCoy achievement level program reaches fulfillment

■ The Testor-McCoy program of modelplanes designed upon an ascending scale of complexity and performance reached a fitting climax with recent introduction of the Senior group. It may be recalled that the Freshman, introduced a little over a year ago, is a simple profile fuselage job with solid balsa wings. Next came the Sophomore which has a similar fuselage but a hollow balsa wing. Junior really gets out of the kindergarten class, for it's a very attractive model with built-up fuselage and wing. And now, *Senior*—a streamlined stunt job with beautifully shaped fuselage, paper or fabric covered wing and capable of flying the whole AMA stunt pattern.

The broad scope of this program can be judged from the fact that each grade of model is also available in three classes, .09, .19, and .29. A builder who takes the whole Testor-McCoy "course" will end up not only as a good flyer, but as an experienced builder, too.

Since a top motor manufacturer is tied in with Testor on this deal, the planes are designed especially for one engine—the McCoy. It goes without saying that equivalent engines of other reputable makes can be fitted into the various ships and will also give good performance. However, the inexperienced builder (and hobby shop salesman, too) need never be in doubt as to what engine will be best fitted for any of the twelve individual models of this series, for every one of the twelve was designed around a specific make and size of powerplant.

Not only is the *Senior* the top number of the series; Testor designer

Nat Bast felt that in winding up this particular development project something really special was required for the *Senior*. That the manufacturer was successful will be seen in the incorporation of the molded fuselage and the key-lock assembly system. The latter has worked out so well that it will probably be featured in future Testor kits.

It is interesting to note that every item needed to put *Senior* in the air—with the possible exception of control wire and handle—is available from the two co-operating manufacturers. Testor markets kit, dope and cement, "39" fuel and prop, to match the McCoy engine and gas tank. The only ingredients neither can supply are building and flying savvy, but if you work through the series from Freshman to *Senior*, *you* can furnish these.

The *Senior* kit, upon which we base this month's survey, comes, like all the others of the series, in an impressive big box. Boxes of all the kits are the same size to facilitate convenient handling and dealer stocking.

All balsa sheet parts are die-cut, of course, and so well done that most of them required little or no edge sanding. As an experiment we tried separating all the die-cut pieces from the various sheets without using any tools whatever. Every part was separated without difficulty.

Let us say right here that there is no need for us to go through a detailed assembly discussion. As befits a carefully worked out educational series, these instructions are *really* complete. In fact, they cover a sheet 22" x (*Continued on page 79*)

(Continued from page 56)
cabin design that will come in the next issue

The entire plane follows the principle of cutting an element out of balsa sheet, then cutting out the inner outline to reduce weight. Sound complicated? Well, it really isn't—just look at the plans and you'll get the idea

Let's start on the wing to see how this easy system of construction works Draw out the full-size outline of the wing on your sheet of 3" x ⅛" thick soft balsa. You can do this best by preparing an enlarged full-size drawing Cut a cardboard pattern to shape and trace the shape onto your ⅛" balsa for both wing halves

Cut the wing to outside shape with a sharp, pointed model knife. Don't try to cut all the way through on one pass, but go around the outline three or four times until the knife point comes through the other side. Use special care when cutting cross-grain—your knife must be *sharp* or it will tear the soft balsa instead of cutting it.

Check the two wing halves with your cardboard form to make sure they are of correct size, then sand the edges to achieve the cross-section shown in wing assembly Step #1. Next, cut the inner portion out of each wing half, again we say—use a sharp, *pointed* modeler's knife and *take it easy!* If you rush the cutting too much and split the wing frame, no great damage is done; just glue it together and work awhile on another part of the model. Make sure one of the wing inner portions is removed in good condition, for you will need it to make the stabilizer.

The cut-out wing outline must be bent to the shape shown in Step #2. To do this, moisten the upper surface all the way across at the inner end, and also about 1½" at each tip. Just dip your finger in water and spread it on the upper surface. This will automatically warp the wing in the correct direction, but you will have to shape it as shown in Step 2

Set the wing outlines aside to dry, and turn your attention to the ribs. The easiest way to make these is shown in Step 3. Cut a piece from the ⅛" balsa stock and trim it to the size and shape indicated. You can then slice off 1/16" wide ribs with a straight edge and razor blade. Make the ribs all the same length and cut them to final length when you install them; cut them short at the rear only, not at the front.

The last items needed for the wings are four ribs of ⅛" balsa shaped as shown in Step 2. Cement two of these side by side to each wing half at the inner ends. You will probably have to fasten them temporarily with a few pins. When they have dried for 15 minutes or so you can insert the 1/16" wide ribs. The latter fit into small notches cut in the balsa outline, and will hold themselves in place if the notches are made properly

The final step of wing assembly is #4 —joining the two completed wing halves at the proper dihedral angle. Sand the inner wing ends so they fit snugly together, then cement them with each tip raised 1⅜" from the table. When this joint has dried thoroughly, rub the four center ribs over a sheet of sandpaper held flat on the table top; the ribs must be smoothed down even with the outline leading and trailing edges, as indicated by dotted line in Step #2.

The stabilizer is made in exactly the same sequence as the wing, but it is a lot easier, for it is made all in one piece, is not bent to shape, and the ribs are just scraps of soft balsa ⅛" x 1/16".

Now we come to the fuselage. Here again you cut the outline from soft balsa, then cut out the center. One-half-inch-thick stock is a bit heavy to cut with your modeler's knife, though, and you should use a coping or jigsaw with a fine-toothed blade. A power jigsaw will speed the job, and one of the magnetic-driven units is ideal, for they cut balsa almost as smooth as a knife. To cut out the inner portion, start and finish at the extreme tail.

One side of the fuselage can now be added. Note that the 1/16" soft balsa siding is put on with the grain running vertically. Cut enough pieces to cover one side (five 3" wide pieces are required), then fasten them on with slow-drying cement. Be sure to cement the joints between the pieces. With one side completed and trimmed, you can put in the tail hook, tail skid, and make the ¼" hole in the nose. Music wire of .042" diameter is used for the tail hook, while our skid was just a T-pin pushed through from the inside. The wood pegs to hold the wing rubber may also be cemented in at this time. They were made from wood safety-match sticks.

Add the covering to close in the fuselage, and when the cement is thoroughly dry, round off all edges, and go over the entire surface with very smooth sandpaper (#3-0, or finer). Windows can be cut in the fuselage and serve a more important function than mere improved appearance—they allow the flyer to peek in and see how many turns are being wound in the rubber. Cut the window covering ⅛" larger than the opening all around, and fasten in place using slow-drying cement.

The landing gear wire is bent from a single length of .042" wire. Put a heavy coat of cement on the fuselage where the wire is to go. Allow this coat to dry, then put on another coat and lay the wire in place. Over it wrap a ¾" wide strip of bandage gauze, followed by more cement. The wheels are 1" diameter, and may be of wood or plastic. If your hobby dealer has none, check the "5 and 10" toy counter. There you can usually find cheap plastic toys with four wheels you can use

The wheels may be held in place with a drop of solder, if you have soldering facilities available; if not, a drop of cement will do.

A nose strip of tin cut from a can and punched for the .042" wire prop shaft completes the fuselage. The strip is held by a tab at top and bottom, and by tension of the rubber. The same propellers we specified for the stick model last month may be used on this plane. The 6" plastic prop is heavier and balances the model about right. If you use the 6" balsa prop, you will have to add a bit of weight to the nose. We strongly advise use of the plastic prop, if you can get it. It has a lower pitch (the blades have less twist—they are more nearly at right angles to the prop shaft) and pulls the model along in lively fashion.

Cut the 1/16" sheet rudder, and cement it in place after the stabilizer has been installed. Then cover just the top of the stab, and of the wing, using lightweight rubber model tissue.

After covering and trimming edges, hold the papered surfaces over the spout of a steaming teakettle for a few seconds. You will see the paper wrinkle loosely, then tighten as it dries out. When the wings have been papered and steamed, but before doping, any decorations you desire may be added. The model shown here has red tissue on the wings; the Vee at the center of the

wing is yellow and all other details are black

The yellow and black markings are a material called Mystik Cloth Tape, obtainable in most drug stores; it comes in a variety of colors and sticks on like adhesive tape. We used the ¾" wide size; a 12" length was stuck to a clean board, and narrow strips sliced off with razor blade and straight edge. The final decorative touch is the Air Adventurers insignia on both sides of the fuselage just below the windows.

Finally, give wing and tail surfaces a single coat of half-and-half dope (half dope and half thinner). Fuselage and rudder should have two coats of this same mixture

The motor consists of four strands of ⅛" flat T-56 rubber. It's probably easiest to make this up in the form of two separate loops, each 10" long; put the knots at the rear hook. Proceed as follows to get the rubber in place: run a one-foot length of stiff wire, with a hook at the end, in through the nose of the fuselage and back to the opening beside the tail hook. Loop the rubber over the wire and draw it out toward the nose. "Worry" the knotted ends of the rubber over the tail hook, then withdraw the wire completely so you can attach the rubber to the prop shaft.

The model should balance at the point shown; add lead weight fore or aft to achieve this balance. Try a glide or two to get the feel of launching the model, then wind the prop about 50 turns for a power flight. The motor will stand about 180 turns, which will give you a moderate climb and a nice flight. You will find that even though this model is "super deluxe" in comparison to the stick job described last month, the sticker will outperform it This is due, of course, to the fact that the cabin model is more than twice as heavy and has a great deal more air resistance because of the fuselage and landing gear

When fully wound, our little ship will make nice R.O.G. (rise off ground) flights, but flights started this way won't equal those launched by hand, as considerable power is used up in gaining flying speed

Building Time: About 4 hours

Materials Required: 18" of 3" x ⅛ soft balsa, wings. 14" of 3" x ½" soft balsa (standard 3' length will make 3 fuselages). One 36" length 3" x 1/16" soft balsa, fuselage sides and rudder 5' of ⅛" T-56 flat rubber. 12" of .042" dia music wire Two 1" dia. wheels. Two brass washers for prop shaft (or glass bead). One 6" plastic rubber-type propeller or 6" balsa semi-finished prop Tin can metal for nose strip. 2" of ¾" wide gauze bandage. One small tube each of fast and slow-drying cement. 1 oz. bottle of dope and of thinner. Model tissue 20" x 6"—lightest grade. Mystik Tape as desired, for decoration Strip of celluloid about .005" thick, 1" x 8" for windows. Two wood match sticks. Wire solder for balancing, if needed

Tools Needed: Modeler's knife with long pointed blade. Razor blade (single-edge type). Long nose pliers. Soft 1" wide dope brush. 2 doz. T-head pins. Small nail to make prop shaft hole. Medium and fine sandpaper.

PHOTO CREDIT LIST

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Baby Mac

(*Continued from page 52*)

Engine Data

Performance. Weight with tank: 1.42 oz. Propeller—6/4 wood: 8,700 rpm. 6/3 wood: 11,900 rpm; Baby Mac: 12,200 rpm; 5½/4 plastic: 13,000 rpm; 5/3 wood: 14,300 rpm. Fuel: manufacturer recommends Testors 39. Fuel level test: 7" at 13,000 rpm. Engine run on built-in tank: 1¼ minutes at 12,200 rpm.

Design Data. Displacement: .049 cu. in. Class: Half-A. Stroke: .390 in. Bore: .4059 in. Stroke bore ratio: .962. Compression ratio head: 6.2. Compression ratio base: 1.36. Port area—intake: .0129 sq. in.; bypass: .0141 sq. in.; exhaust: .0445 sq. in.

Construction Features. Bearings—crankshaft. aluminum; crankpin: aluminum; rod, small end: aluminum. Tank can be attached for upright or inverted mounting.

Parts Illustrated

1. Crankcase, die-cast aluminum, .31 oz. 2. Cylinder, steel, .4059" bore x 31/32" long, .25 oz. 3. Cylinder head, aluminum, ¼-32 thread, .07 oz. 4. Tank and back cover, die-cast aluminum, 17/32" long, .19 oz. 5. Glow plug, steel, ¼-32 thread, .08 oz. 6. Glow plug washer, copper, .032" thick, .01 oz. 7. Needle valve, steel, 1-72 NF thread, .02 oz. 8. Needle valve spring, steel, .166" O.D., .01 oz. 9. Piston, steel-hardened and ground, .4056" dia.; connecting rod, aluminum, 21/32" long, .10 oz. 10. Base gasket, Vellumoid, 1/64" thick, .00 oz. 11. Crankshaft, steel-hardened and round, .2185" dia., .19 oz.; drive washer, aluminum, ½" dia., .02 oz.; front washer, steel, ½" dia., .04 oz.; propeller screw, steel, 6-32 NC thread, .03 oz. 12. Mounting bolt, steel, 3-48 NC thread, 1" long, .08 oz. 13. Tank gasket, Vellumoid, 1/64" thick, .00 oz. 14. Tank rear cover, aluminum, .020" thick x .775" dia., .02 oz. Total weight: 1.42 oz.

Fleet Trainer

(*Continued from page 36*)

coats of clear dope to the inside of these panels. This greatly assists the bending of sheet balsa. Trim these to fit fuselage and cement in place.

Now cut out the cockpits. The two pieces of 3/16" sheet fill-in between firewall and the beginning of the side stringers may be glued in place. A small balsa block is used on bottom of fuselage directly aft of firewall. Now you can shape these blocks by sanding to fair into fuselage lines. A special system was used in construction of the turtle-deck in that a block of soft balsa is cut to conform to the fuselage, lightly cemented in place, then by using a sanding block, sandpaper eight flat sections as shown in the sketch.

When this is finished remove and hollow block to within approximately ⅛" thickness. Now re-cement to fuselage and you will have a section that is only slightly heavier than the built-up type, and without the trouble of lining up stringers or having them warp out of shape with the pull of doped covering.

The complete tail surfaces are to be cut out of ⅛" sheet balsa. Sandpaper leading edges to a round cross section, changing to a taper to trailing edges. Cut elevators apart from stabilizer and cement hardwood elevator spar to elevators. Bend elevator horn from .024 shim brass, cement to elevator spar and cement cloth reinforcement over it. Now install elevator hinges and join stabilizer to the elevators

Wing construction and additional details will be found on AT's full-size plan.

Four to Five

(*Continued from page 38*)

that will make our flight the full five minutes. Remember, we're speaking only of the ship to get you on the team.

In this article we're presenting and analyzing four ships which *have* bettered four minutes consistently, and attempt to give reasons why. From this you may draw your own conclusions and design your own models.

Ed Lidgard, Wakefield team member in '49 and '50 and present Chairman of the Wakefield Committee, used a small ship, as Wakefields go. *Effective* wing area is but 176 square inches; however, computed by present rules, it would be 195 square inches. The smaller wing (and lessened drag) allows for a terrific climb, says Ed, and he's right. Despite the higher wing loading, the ship has an excellent glide. Ed estimates that his ship got 75 feet higher than Ellila's at the '49 Finals, but Ellila's ship glided where Ed's dived in. This has been corrected by making the airfoil, (and thereby the whole ship), less critical.

The stab has about ten degrees anhedral, and this, with the single-strut landing-gear, satisfies the three-point take-off requirement.

The deep, whale-like profiled 38″ fuselage carries 42-48 strands of ⅛″ T-56, the 52″ motor taking a safe 1,450 turns. Motor weight is five ounces, or 54% of the total weight of the ship. The 18″ diameter 25″ pitch prop gave a 65-second motor run, and the ship makes 4:15-4:30 in still evening air.

R. G. Schmitt's ship, second in the '50 Chicago area team eliminations (and the one to go to Finland) is a fine example of sheet balsa work. Wing and stab have stiffeners rather than spars, with spar loads taken by the widely sheeted leading and trailing edges. Very efficient, rugged, and warp-resistant if you can get the wood to do the job. Fuselage is basically diamond, with the faired-in wing platform completing cross-section requirements. Note the diagonal bracing throughout the basic frame.

51% of the total weight came from the 28 strands of 3/16″ T-56, 56″ long. This swung an 18″ prop for a bit over 50 seconds on 1,200 turns. Flight time in still evening air: 4:10-4.25.

Ehrlich's ship is a streamlined box, similar in profile to Lidgard's, but with shoulder wing mounting. Fuselage is a basic box faired off with stringers along the sides, top and bottom. Wing is parallel chord, and of usual construction but having a sheeted leading edge and an anti-warp diagonal member from tip TE to center-line at the LE.

18″ prop is carved as close to true pitch as possible, has a bamboo LE. Power: 18 strands ¼″ Dunlop 54″ long, 1,100 turns, 90 second motor run. Rubber equals 53% of total weight.

Neurosis II, the author's ship, is different in that the fuselage is of sheet construction. It has proved quite tough, easy to build and easy to repair. Ready to use, the fuselage weighed in at 1.7 ounces, comparing favorably with orthodox construction.

Wing worked out to 209 square inches effective, and 217 square inches area by present rules. Stab has anhedral, similar to Lidgard's and Ehrlich's. Rubber weight is 51% of total, using 16 strands of ¼ x 1/24 T-56 50″ long. 1,100 turns swung the 17½″ prop 65-70 seconds. Flights in still evening air ran between 4:15-4:30.

Now for the common features—those that probably contribute to the duration obtained.

Except for Lidgard's, all models come to within a hair of maximum allowed areas. Though the greater area may slightly reduce climb, it is compensated for by better glide and greater visibility. *None* of the wings weighs *over* 0.9 ounces, and each wing has some arrangement—sheeted LE, Warren truss ribs, etc.—to prevent warps. Airfoils average about 10% thickness, and are

mostly cut-and-try-types derived from known airfoils. The average aspect ratio falls between 7 and 8. The planforms are simple almost to an extreme.

Three of the ships have anhedral stabs, and for more reason than to afford two extra points on the ground. We have found that this arrangement tends to keep the model from diving as it wheels into the downwind part of the circle. It also tends to keep the model more level when circling and therefore less susceptible to spiral upsets. All ships had undercambered sections in the stab—generally a slimmed Clark Y (about 9%) with an average of 1/16" undercamber. It makes for better stall recovery and at the same time lets the stab carry part of the load. Complete tail assemblies weighed from 0.37 to 0.45 ounces.

In every case fuselage is at least 36" long, and with the new rules and the attempt at greater motor run, it will probably be longer. (It follows that, to get greater run you must have more rubber, and therefore more room for the rubber.) Every fuselage used some sort of a Warren truss for beefing-up purposes, for the large Wakefield motors develop an awful lot of twisting power.

Even though the sheeted sides took up much of the load in my ship, I still had interior bracing. Lidgard used internal bracing, and covered with silk. Schmitt used truss throughout, and covered with Jap tissue. Ehrlich used the truss plus stringers and double (cross-grained) Jap tissue covering. In every case the fuselage is the toughest part of the airframe. It takes the load of the motor, the handling, and the shock from the parts attached to it.

In the past take-off gear has been either wire, (too heavy) or bamboo (too weak as single strut). The trend is toward a built-up balsa strut, which can be made light and tough. Small wheels are preferred over simple skids, by the way, even though there is no wheel requirement.

In the four ships mentioned there is not one fixed (or two-wheel) gear. One wheel is satisfactory, lighter, and easier to retract. The retracting does more than reduce a bit of drag—it stays out of the way if your ship happens to snag in a tree, and it makes for easier packing of the model.

Props in each of the ships are different, and are best compared by saying each is 18" diameter, and has a PD falling between 1.35 and 1.8. The higher PD may be necessary now to lengthen the motor run. All props are folders, though there has been some discussion about the practicability of them. Hinges used are of the variety sold by Midwest Models. All props are covered after carving with either silk or tissue, and all are cut back from the hub to allow them to flare to higher pitch in the initial power burst. Each prop is backed up with 16 or more strands of ¼", the length being more or less determined by rubber weight and distance between hooks.

The method used to get the most out of a rubber motor will determine, generally, the type of ship built. We normally use a single, tensioned motor and one prop. The motor length is determined by two things, as mentioned before, and should fall between 1.5 and 1.75 times the distance between hooks to get the most efficient arrangement for power output and minimizing of bunching. This length will give a motor weighing a bit over four ounces for 16 strands of ¼", and is easy to handle, easy to wind to maximum after some practice.

This, of course, can be juggled around to get a motor that weighs the same as the airframe. Consider also just how many strands you can *efficiently* wind; we find the 16 strands mentioned a good high figure.

Gears, as in Ellila's ship, allow for two motors on one prop, giving the equivalent of a twice-motor-base-length motor. About this arrangement we know very little, having never tried gears. Our one objection at the moment is that, after the first motor is wound,

it must be held until the second is wound and attached. Since we have found that the best thing to do after winding a motor is to let go and get the most power, that delay bothers us

Another approach is two motors and two props. This can be either a twin tractor or pusher, or the more practical push-pull. However, the additional weight of the prop and nose unit, plus some added rubber, doesn't make this too good for a conventional layout, though it looks like it may be a fair deal for a flying wing

In any event deviation from the single prop with one tensioned motor will result in gadgets of some sort, and gadgets are the bane of a contest model until they have had all the bugs ironed out The fewer things you have to fool with during the critical wind-and-launch period, the better are your chances of winning. We're not against designs that deviate from the normal types; we believe experimental designs should be encouraged. But we do say that to bring to a Wakefield elimination a design that has yet to be proven is folly.

After looking over the general view of Wakefields, and the models of this article in particular, we think the following is a good guide toward design of a highly competitive contest ship:

1. Build as close to the rules as possible, staying within them just enough to make processing a simple task

2. Work toward a 75-second prop run that will get your ship up to at least 400 feet under power. Since the average sinking speed of a Wakefield is 2.25 ft./sec, 400 feet of altitude results in a glide of 2:58 after the 1:15 motor run. The resulting flight of 4:13 is reasonable

3. To accomplish (2), the model should weigh no more than 8.2 ounces, of which 4.1 ounces must be rubber To get real time out of the present day model *at least* 50% of the weight

must be devoted to power.

4. With all that rubber thrashing around in the fuselage, there are other things to consider. Got to have room for it. Minimums are: 1½" square at the nose, 2½" square at maximum cross-section and 1¾" square at the rear peg. The interior of the ship should be clear of protrusions. And it's a good idea, after the fuse is complete, to pour about a pint of thinned dope into it, then drain it out again, thus giving the inside a neat, protective coat of dope.

5. Again, keep clear of complicated and untried gadgets. If it can't be repaired on the field after a simple crack-up, get rid of it. Also, remember that each of us habitually tends to make some part of the ship weak. One breaks wings, the other, stabs. Find your fault and correct it *before* the ship is built.

6. A well-adjusted model is one that retains wing, tail and other settings. Use pins or pegs to key *exactly* every movable unit, and especially the wing, since the Wakefield rules still call for the prop/wingtip launch.

7. If possible, try several different prop/motor combinations on your ship. The yo-yo boys with their speed jobs are a fine example of what can be done by simply fitting props to conditions.

With the above there are a number of things that we may also think of. Light, strong structures, for instance, to allow for more rubber. Better design of props. Vibrationless prop units. Learn the capacity of the rubber. Learn how to wind it to the limit. Adjust the model fully. Learn how to R.O.G. the ship.

Make flying the model a habit, not a program that must be memorized. Know what it will do *every* time. Make a habit of using the dethermalizer, even for test flights. Check the ship in both good *and bad* weather. When you can get to the point where flying the model is as mechanical as the driving of a car, you've become a threat at *any* contest.

Turbo-Props

(*Continued from page 27*)

piston engine installation, to say nothing of adding higher take-off power and better power at altitude. Powerplant control equipment is largely electronic. The cockpit unit is a single lever for each turbine.

W. C. Keller, Convair's project engineer on the Turbo-Liner, takes a close look at maintenance and operating economies. He sees cost of spares to be about the same as now. Line maintenance time and costs will drop, due to the absence of such troublesome items as spark plugs and magnetos. Because of absence of engine vibration, airframe maintenance will become materially less. Keller calculates fuel costs at 12-14 cents a gallon, provided kerosene or ANF158 is used.

"For extremely short ranges," said Keller, "the turbine-powered Convair-Liner is superior to the curently used airplane, with the fuel consumption crossover occurring at a range of about 400 miles for the worst case. A substantial gain occurs when the lower priced fuels are employed. ANF-58 gives roughly the same operating cost as kerosene, but kerosene, burning hotter, substantially extends the range of the aircraft. Current flights of the Turbo-Liner mark a real milestone on the road from research to actuality. The propeller-turbine-powered transport will become a permanent category of aircraft for short-range operations, and will demand a high degree of competition to be displaced in long-range operations by jet propulsion."

Undoubtedly turbo-jets will gain wider use in military aircraft of various types. Experience with the Douglas AD Skyraider attack bomber bears this out. What the Navy demanded was an airplane capable of operating unescorted and defending itself against jet fighters.

It became apparent the designers must double the airplane's power with no appreciable increase in the airplane weight.

"This was a big order," you learn from E. H. Heinemann, a Douglas chief engineer, "and so we studied all known methods of propulsion. Turbo-jets appeared promising, but with available engines it was impossible to meet take-off and endurance requirements. Best solution appeared to be the turbo-prop engine, preferably one with a dual engine arrangement so as to permit single-engine operation at low altitudes of greater endurance and equipped with a counter-rotating propeller to eliminate propeller torque during take-off and landing."

So powered, up came the A2D Skyshark. Results? Bomb load upped some 50 percent over the AD, while fuel consumption per pound of bomb per mile remained about the same as for the piston-engine plane. But the turbo-prop brought other important advantages. Unusually high operating altitude, high speed approaching that of jet fighters—those are a couple. Read on: The ATD carries four times the amount of bombs per gallon of fuel as jet attack planes. It takes off in less than two-thirds the distance of jet fighters and less than one-third the distance of jet bombers. It can operate from the smallest carriers afloat. This is only a forerunner of other military applications to come.

Seldom does such an unromantic development as a new engine hit the public with the impact of the T-34, Pratt and Whitney's candidate in the race for more power. Only last summer farmers tending their tobacco crops in the Connecticut River Valley found their toil disturbed by a strange sight overhead: a five-engine airplane soaring gracefully through the New England sky. But, to their amazement, only one engine was ticking. The other four propellers were silent.

What they saw was a venerable B-17, its piston engines dead, a T-34 Turbo-Wasp running relatively silently in the nose. Pictures of that installation gained wide publication, but it was no stunt. It was a practical demonstration of the power of a new TP. And to prove just how good it is, a few weeks later Harold Archer, chief engineering test pilot for the company, flew the same airplane on the T-34 alone (all other props feathered) across the Naval Air Station at Patuxent River at an altitude under 100 feet and a speed 100 miles an hour faster than the B-17's normal cruising speed!

As it flew, the T-34 delivered about 90 percent of its power through a shaft to the propeller, with the remainder in jet thrust through the tailpipe. Designed to produce the equivalent shaft horsepower (actual shaft horsepower plus jet thrust) of 6,000, the engine won an early rating of 5,700—more than the 4,800 combined total horses of the B-17's regular piston engines.

But this is only a beginning. P and W engineers confidently expect to produce 8,000 horsepower from this engine before they cease to tinker with its innards. Even now, it is the most powerful American-made TP, surpassing by a comfortable margin the 4,000-hp Wasp Major R-4360, in its latest compound version. Still leading in its field is the J-48 jet, rated a 6,250 pounds static thrust before afterburner or water injection.

While other American companies manufacture their own engines, Curtiss-Wright has found it expedient to develop further four British gas turbines—the Sapphire (a turbo-jet), of 7,200 pounds thrust; the Mamba, developing 1,570 horsepower; the Double Mamba, of 3,140 horsepower, and the Python, with 4,550 horsepower. These engines come to the U. S. under an engineering and manufacturing agreement with Armstrong Siddeley, Ltd. of England. All will be modified for Yankee production methods.

An advanced series of subsonic, transonic, and supersonic propellers is ex-

pected to pave the way to the eventual attainment of speeds up to 1,000 miles an hour with long-range, propeller-driven bombardment, troop-carrying, and transport aircraft. At first, these recently announced props will be used in planes capable of cruising up to 600 miles an hour. C-W research indicates, however, that double these speeds can be achieved in propeller-driven air craft of the future. C-W's turbo-electric props are designed for use with turbo-prop engines as powerful as 20,000 horsepower! They promise both higher speeds and greater fuel economy. Among the first military installations will be the application by the Air Force of turbo-electrics to the turbo-prop version of the long-range Douglas C-124 troop and cargo carrying transport

Allison Jets

(Continued from page 27)

schedule. These developed far more power than the biggest reciprocating engines, but they had short life and were plagued with all the troubles of a new product. Today, many problems still remain but as a result of hard work and experience, tremendous progress has been accomplished. For example, the J33, first turbo-jet engine made by Allison, originally was rated at 3,750 pounds thrust. Present production models develop 5,400 pounds of thrust with water/alcohol injection. In 1945 this engine weighed 1,960 pounds in comparison with its present weight of 1,775 pounds. Formerly the J33 had a life of less than 10 hours on the test stands. Now it is allowed more than 300 hours between overhaul periods. At the same time there has been a 10 percent improvement in fuel consumption.

No one single discovery made this improvement possible because, in all, there were 1,500 changes involving virtually every part of the engine. Some of these changes which have been important to the advancement of the engine are: a weight reduction in the turbine wheel of 55 pounds . . . the compressor rotor is now assembled in three parts instead of being machined from one casting . . . changes in the design of the blades have increased the compressor's efficiency . . in fact, air flow capacity has been increased by 20 percent at the same compressor speed.

In 1947 Allison added another type turbo-jet engine to its development and production program—the axial flow J35 Like the J33, the J35 has undergone extensive development. Thrust has been increased 45 percent per pound of engine weight, to its present rating of 5,000 pounds of thrust, and it also is allowed 300 hours between overhauls.

Two still newer engines recently have been added to the Allison gas turbine family. Developed for the U. S. Navy, they are the T38 and T40 turbo-prop engines, which develop more horsepower for each pound of weight than any other propeller type engine ever flight-proved.

A single unit axial flow type gas turbine, the T38, has a 17-stage compressor, 8 combustion chambers and a 4 stage turbine. It develops 2,500 horsepower for only 1,225 pounds of weight and is connected to a reduction gear through an extension shaft.

Two of these engines are scheduled for installation in a Convair 240 Turbo-Liner purchased by Allison as a flying test bed to provide experience in turbine-powered transports.

Second new engine is the T40 turbo-prop which actually is two T38 engines coupled together into one twin power-plant. The T40 develops 5,500 horsepower and weighs 2,500 pounds. Contra-rotating propellers are driven through two extension shafts and a common reduction gear. Four T40 twin turbo-prop engines power the U. S. Navy XP5Y Convair flying boat at speeds well in excess of 350 miles an hour. One T40 also powers the Douglas A2D.

Activity with these four engines makes the Allison Division the first manufacturer to simultaneously develop and build axial and centrifugal type turbo-jets plus turbo-props. With continuing effort going forward on these four projects simultaneously, Allison is making its bid to keep its place among the leaders in turbine engines both in this country and abroad.

Mr. [illegible] comments are presented through the courtesy of Ryan Aeronautical Company and its 'Ryan Reporter.'

Half-Pint

(Continued from page 33)

what it was all about, but they filled the bill. The prop—ground-adjustable for pitch—is only 60 inches in diameter

It took 14 months to design and build the Stits Jr. and it cost Ray $5,500, counting his labor. When it was finished, his trouble still had only begun Now came the job of getting it into the air, which involved—first of all—the job of finding someone to fly it. Ray was a licensed pilot but too heavy (180) for the Stits Jr. He tried to take off and couldn't even get the tail wheel up

He finally found a pilot. The pilot took the Stits Jr. off the ground five times—and cracked up three He walked away from each crack-up, but Ray had to rebuild the ship. "I'll give him credit for having the guts to try it, though," says Ray.

Then he heard about Bob Starr Bob was a young crop duster at Lansing—a P 51 veteran of the China-Burma India theater. He'd joined the Caterpillar Club over the China coast when he ran into Japanese ground fire and bailed out 400 miles south of Shanghai. Since the war he had been doing a lot of air show work besides his crop dusting He had 5,000 hours of flying time and —of no less importance—he weighed only 160 pounds.

When their baby was well shaken down, Ray and Bob took her on the air show circuit, carting her around on a trailer. Recently they transferred their base of operations from Battle Creek to Phoenix, Ariz., which is Ray's home town. Phoenix, with its year-around flying weather, gives them a chance to put the Stits Jr. in the air any time they feel like it

Ray's aerial smidgin, licensed now as an experimental ship and restricted only against operations over congested areas, is the star of every show it enters. It's usually the last item on the bill, by which time the crowd, having examined the sprite, is rather evenly divided on the burning question of the day: Will it fly or won't it?

Most people, says Ray, "want to see it fly before they'll believe it." Many demand to know where the "rest of the wing" is. An occasional disbeliever, spying the Stits Jr.'s radio antenna, thinks that's the missing piece in the puzzle. "Shucks," he says, "I'll bet it's radio-controlled." Ray's reply is straight-faced: "Yes, but we have to send a man along to control the radio."

At one show last summer, a physician in the crowd bet his companion $500 that the Stits Jr. wouldn't fly. He paid up like a sport.

"Even when we dicker with the sponsors of air shows," says Ray, "we have to convince 'em. They think there's a catch to it. They're used to gyps "

The Stits Jr.'s air show routine is sweet, quick and simple—a few turns around the field, some straight and level flying and buzz the crowd. Bob stays up no more than a half-hour at a time, keeping a half-hour of fuel in reserve And no aerobatics, because, of course, no chute

The ship is so sensitive that Bob flies her literally with two fingers—his thumb and index—bracing his wrist on one knee. "In any other plane you can sit up there, trim 'er up and fly

along thinking about your girl or something," he says. "With this job you think about flying it all the time."

But the Stits Jr. is still sturdy enough not to require perfect flying conditions. At the Miami (Fla.) All-American Maneuvers the wind was hot and gusty, and several acts had to be canceled. But the little job came through without faltering. On another occasion it flew with wings iced over. Only once has Bob Starr had to make a forced landing. At a Michigan show his engine conked. He dead-sticked in without mishap

Not unnaturally, the Stits Jr. holds boundless fascination for curiosity seekers "Everybody has to touch it," says Bob. "If the local sheriff stepped up just before I take off at an air show, he could get the fingerprints of everybody in the county."

To casual onlookers such as these, the Stits Jr is doubtless a freak. But to its designer and builder it is far more than that. He believes the trend in private aviation is toward smaller ships And he is convinced that his mighty midget incorporates innovations of design and structure which point the way to a new type of small, fast sports plane—in a word, the aerial hot rod of tomorrow

That Ray Stits isn't alone in this idea may be deduced from the fact that a company in France has expressed an interest in mass-producing the Stits Jr But Ray intends to go it solo. He has already started construction of another ship—not quite as small as the Stits Jr. but still smaller than a Cub—which he intends as the prototype of a speedy little sports plane to be manufactured by his own firm. The test pilot for the firm? Bob Starr, of course

The vision of airports all over the country a-swarm with these aerial gnats may seem far-fetched. But don't bet your money that it won't happen Ray Stits, if you'll remember, is a guy who loves to put the skeptics in their place

Prof. Phugoid

(Continued from page 51)

line considerably more than two or three degrees downwards. This is an easy adjustment to make, particularly in the case of the gas model, and it is certainly O.K. to use it as the vast majority do. However, the popularity of its use in most cases results from the fact it is the only method of correction known rather than being preferred, and when the amount of downthrust required is greater than two or three degrees the trouble lies in having too stable an airplane. Then the procedure outlined above should be used for best results.

The author has taken several rubber and gas models with extremely large amounts of downthrust which the owners claimed to be necessary to prevent looping under power, and improved the duration considerably by removing most of the downthrust, shifting the center of gravity to the rear, and retrimming with the stabilizer for a good glide. The reader is encouraged to try this method as the results are readily noticeable and quite pleasing.

Careful observation of the flight path will point out whatever bad features in design or adjustment are present. If a model, particularly a rubber one with its large propeller, tends to yaw or fishtail from right to left to right, it is a sure sign that more area should be added to the vertical fin, preferably to the top or bottom. Similarly, if a rubber model fully wound and launched makes one or two rather vicious turns, then straightens out and climbs up, it is definite that more vertical fin area should be added. Rubber models require considerably more fin area than do gas models (in proportion to wing area), because they have, in proportion, much larger props and more fuselage area forward of the center of gravity. The amount of fin area necessary is usually from ten to fifteen percent of the wing area for rubber jobs, and around five percent for gas jobs.

Too much dihedral will cause spiral dives, while an insufficient amount will allow the model to sideslip excessively. The amount is best determined from experience, but a good rule of thumb is to have about eight degrees under each wing when straight dihedral is used. The type of dihedral is largely a matter of personal preference, as all can give good results if the proper amount is built in. Naturally, polyhedral or tip dihedral requires more angle under the outer tips than does straight dihedral.

The stabilizer area on free-flight models usually runs from 30 to 50 percent of the wing area and seems quite large to the non-modeler. While it is true that this large size stabilizer increases the stability, the main reason for using the large size is that it quickly stops or "damps out" any longitudinal oscillations which may occur. Stability can always be obtained with much smaller stabilizers simply by having the center of gravity far enough forward, but a small stabilizer will definitely not provide sufficient damping of longitudinal oscillations.

As a practical illustration, suppose a hot-climbing gas job has the engine cut while the nose is up steeply. With a small stabilizer this model would make a very large number of dips or oscillations before the glide finally straightened out, and much valuable

altitude would be lost. With the large stabilizer, however, the glide should be steady after only one or two dips, and relatively little altitude would be lost

There is one trait of certain models of very "clean" design that should be mentioned. It so happens that an airplane which is quite smooth aerodynamically may be trimmed perfectly for a good flat glide, but after gliding well for a while will develop, very gradually, a pitching oscillation which eventually works into severe and violent stalls. That is, the model will be gliding perfectly and then a slight dropping of the nose will be noticed. This is followed by recovery and nosing up slightly, after which comes a greater nosing down motion, and so on, until the severe stall is reached

This motion *cannot* be corrected in the manner used for preventing the ordinary stall, for if positive stabilizer incidence is put in, the ship will dive or glide much too steeply. The only correction that can be made easily for this condition is to make the model circle more tightly. This will work in most cases. The other, and certainly less desirable method is to add a spoiler or something similar which will increase the drag of the airplane.

The technical name for this motion is "phugoid," meaning a divergent oscillation. The effect is present in most every very clean and streamlined full-scale aircraft such as the F-51 fighter and many jet fighters. The motion is very complicated to analyze as it comes about from many factors which affect the dynamic stability of the airplane It is sufficient for the model enthusiast simply to be able to recognize the motion without confusing it with the ordinary stall, which comes from improper glide trim, and to know how it can be corrected when it does occur

The effect is most often seen in models of very clean design with folding propellers which are not gliding in very tight circles. A sketch showing how this motion develops was shown in Part I (last issue), along with a picture for comparison with the ordinary stall.

Big Dirigibles

(Continued from page 31)

of our national fuel supply

Used as a flying tanker, or carrying supplies and personnel, the dirigible would be an important supplement to the nation's transport planes and its merchant marine. Also it might bring wounded men back to the mainland on its return trip

The craft could be operated from the blimp bases built along both coasts in World War II, *could be serviced for the return trip at masts quickly set up wherever needed overseas.*

There are other places where the big ships might be used. Some preliminary studies have been made of the possibility of using them as radar interceptors in the Polar regions, cruising at low speed for long periods. There is also the possibility of their acting as flying laboratories in the development of atomic engines for aircraft.

It might be pointed out also that an airship need not be put away in moth balls in time of peace. It would be a simple matter to convert it to commercial use, which is, perhaps, its real field. For the dirigible can carry passengers with a comfort comparable to the luxury liner, except that there is no seasickness aboard. Its great size enables it to smooth out the rough air which often makes airplane travel uncomfortable. The large rigid airship is

an opportunity America has, up to now, not utilized. We should be readying them for service now before it is again too late.

The establishment of a commercial airship line would, in another emergency, provide the nation with a merchant marine of the air, with a full complement of bases, service facilities, and trained crews available for duty on short notice

No form of transportation can rest on its laurels for long; there is an unceasing trend for improvement. Our own generation has witnessed progress in overland transportation from the oxcart and horse-and-buggy days to the automotive era, and now the adoption of petroleum-powered vehicles for air transportation. Priority traffic bids fair to shake off the shackles of land transportation to take to the air. Progress will demand this

There have been similar and paralleling developments in transoceanic transportation. The age of sail gave way to the age of steam and wooden ships were replaced with vessels built of steel. Here, too, the trend is inevitable for priority traffic; the ships must be made of lighter materials like aluminum, and lifted from the surface of the seas, to sail through aerial oceans instead. Water displacement must give way to air displacement.

With high-speed planes, low-speed surface ships and medium-speed airships, America could have the greatest global transportation system of any country—and *due to our monopoly of non-inflammable helium gas, is the only country which can use all three.* And this country flanked by broad oceans could use the long-range airships to better advantage than any other on the globe

Most of the criticism of the airship is due to lack of understanding or misunderstanding. It is not a combat craft and is not invulnerable any more than transport planes or lightly armed and lightly armored surface ships. Like other transports it would need air cover Used in its proper place, however, it could materially step up the movement of war materiel over water

Airships have been lost, but setbacks are to be expected in any new vessel, or even those long established, like the railroad train and the steamship.

That lighter-than-air craft can be flown safely is attested by the long record of ocean crossings made by the Graf Zeppelin and the Hindenburg, up to the time that the latter was lost—a disaster which would not have happened if the safe American helium had been available to it, instead of the inflammable hydrogen. Helium will definitely not burn

Further indication of airship safety is given by the half a million passengers carried by the Goodyear blimps all over America in the last 20 years without a single passenger casualty, or for that matter by the excellent safety record made by the Navy blimps in World War II in their anti-submarine patrols of both coasts, and the Gulf of Mexico, and even as far south as Rio de Janeiro and east to the waters of the Mediterranean

America has no rigid airships today. However, this country has the construction sheds and specialized equipment needed to erect them; the largest accumulation of engineering and research experience available anywhere in the world; an all but inexhaustible supply of helium; and finally a pool of 3,000 flight personnel and 7,000 ground service men who trained on blimps during the last war and could adapt their experience to the larger ships, using a small training airship, if necessary, as a first step

The fighting may end in Korea, but we have had a warning The threat to national security and world peace will remain. Rigid airships, like battleships and carriers, take a long time to build We should get a transport airship construction program started without further delay.

XF-92A

(Continued from page 40)

The body could be turned on a lathe However, as it is rather small, too much difficulty should not be encountered if done entirely by hand. If lathed, be sure to use high speeds and sharp gouges and skews, otherwise tearing of the wood will result. Sand and clear-dope while still on the lathe and don't forget to use fine grades of sandpaper at all times. Number 350 or 400 Durex wet or dry is all that is necessary on soft balsa. Before splitting the blocks for hollowing out, be sure that the two coats of clear dope are thoroughly dry. This will keep the thin walls strong and they will have less tendency to warp. Carefully gouge the inside to a thickness of about one-eighth of an inch. Hold the shells up to a light now and then to be sure you are not getting it too thin in places. Now sand the inside and give one coat clear dope. Note the shape of the Jetex mounting screw holder Carve from a medium or hard block of scrap balsa. Split the block on a straight line along the side and imbed the mounting screw, making sure it is perfectly straight in all directions.

Glue the top half over it and when dry, glue the completed block in place on lower shell. Now glue the two shells together and set aside to dry. The plans show this installation for the Jetex 100. If you are going to use the 200 Jet, lower the mounting screw line one eighth inch as shown on the plans. Also glue mounting block further forward one-half inch. You will have to fly without the hatch in place when using the larger jet.

You can now very carefully cut the three slots to take tail and two wings. Cut wing slots so that top of wing slot is just at glue joint of the two shells. Give tail slot a two or three-degree offset; or if you wish, you can glue the tail dead on and put a quarter inch offset on rudder.

You can now assemble entire model, checking frequently that the three units are in line. Add bubble canopy. I have used solid balsa ones on mine as this particular size is not available ready-made in Canada. Give all joints a second coat of glue, then let dry before sanding all over lightly. Fill any nicks with filler material and sand again

Now, for a super-gloss finish. Any high finish, as you probably know, is impossible without a smooth base, so let's start with six good coats of Duco Primer. When dry, sand this with #350 or #400 wet or dry paper, using water. You should continue sanding until it looks like dull glass. Now apply at least fifteen coats of silver dope. This is much easier and quicker than you may at first think. Because the dope should be the consistency of water, it will dry almost immediately. In fact, you will find it will take at least four coats before you can cover the primer coats to a point where you can see the change in color! Therefore, your dope should be mixed to a minimum of of 40% color dope and 60% thinners.

It will dry very quickly but be sure it is dry between coats or it will never dry *properly*. It is, therefore, wise to wait about five minutes between coats. Apply with a good quality half-inch brush. Mask off the portions that are painted dull black in front of bubble canopy and give one or two coats. Apply decals. The secret of a high-gloss finish when using silver dope, is to apply three or four coats of clear dope at this point and to rub down these top coats instead of rubbing the actual silver dope. Do this rubbing down after letting the clear top coats dry for at least 48 hours. Using a fine rubbing compound, bring to a super-gloss finish. Automobile wax (silicone type) may now be applied, highly polished, and the painting job is finished.

With a sharp knife, carefully remove engine hatch underneath and try your Jetex engine. The model can be flown with or without hatch in place, if using

the Jetex 100. In that case, hold it to the fuselage with two strips of Scotch Tape. Use one strip in front for a hinge and after lighting the fuse, quickly close the hatch, and seal the second strip over the rear portion. Be very careful when lighting the fuse not to burn the fuselage; a cigarette is an easy way.

To fly pylon style, punch or drill a hole near the wingtip (not too close to the point or loss of strength here will result) and another about one-quarter inch back from the nose. Tie securely one piece of strong linen thread about a foot long from one hole to the other. Take the nine foot cord from the pylon stick and tie it to the other cord at a point where the model will hang in a perfect triangle when the cord is held at this point.

Place a drop of cement at these points so the cord will not slip. Now one person can hold the stick high above his head while the other can light the fuse. As soon as smoke streams from the rear of the model, the first operator can whip the ship a bit to get it started. From then on, stand back! It will pick up speed quickly and the operator just has to hold the pylon stick with both hands straight up and down. The run will be short and sweet. It is best to whip the jet around a few times after the run to help cool it and also to give your helper a chance to catch it as you slow it down. Be careful at this point not to touch the jet engine as it stays hot for about five minutes.

I have used wheels on a couple of models and also tried a dolly take-off, but as the run is so short I found these additions hardly worthwhile. Scale fans can add these details to this model using paper-wrapping wire and small rubber wheels.

Weight complete, less details, should be about two ounces. By making the body slightly larger through the middle, you can use the Jetex 350, if you so desire.

Balsa Gliders

(*Continued from page 45*)

The original body was used, shaped to fit individual need. This means that only the original wings have to be removed from the fittings. Thus the mechanism will work at all times. Since sweep-back wing brings the C.G. further back, a larger rudder is used. The wings themselves are cemented in the metal fittings. Launching the folding wing model may be a bit difficult because the rudder must be held between the wings to prevent opening.

To get real high altitudes without any sort of folding wing device, the catapult glider is "the thing." O-O setting of the wing and stabilizer, long moment arm, and small stabilizer contribute to give it arrow-like trajectory. No matter where you point it, that is where it will go. The height achieved will naturally depend on the amount of rubber used. Start with low power and gradually increase. But be sure you have plenty of launching area as well as a lot of running space.

Of course, this arrow launch also means that you cannot have any kind of turn setting. And the glide is more or less at the mercy of the winds. If you try catapult gliders, make sure that the wing and tail are well constructed, that the incidence is O-O, and moment arm long. Any deviation will mean big loops that are liable to catch up with *you*.

The trouble with towline gliders is that the builder usually has to run with the towline, and thus cannot see what goes on. A cure for this situation is to use a combination of regular towline and catapult. By using about 75 ft. of kite string and 25 feet of 2-strand 18" wide rubber, enough power is supplied by the rubber to give the model almost normal towline pull This system makes it possible for you to fly

gliders alone without anyone to hold the model

We have a theory for the O-O, long moment arm, 60% balance glider based on *circular airflow*. When a model describes any sort of a curving path, the airflow changes on the model. And this change is such that the stabilizer gets a more positive flow than the wing. The result is that the stabilizer brings the wing into lower angles of attack. This reduces the lift, which may be excessively high if wing is held to the original glide setting, and thus prevents looping. The drag is also reduced Hence, whenever a glider, or any other model is in a curving path, the circular airflow changes happen. And the O-O setting takes advantage of this fact very quickly

In the case of the hand-launched glider, you will notice that no matter how it is launched, the climbing path is curving. In some cases, it may be an open helix, while at other times, just a half spiral will bring the model to the top. In case of sweepback, the setting was not O-O. To obtain low lift at high speed, it had to make small or tight circles or loops.

The trouble is that the very setting which gets the O-O glider up, prevents it from having glide turns tighter than we now have. In fact, the glider should be adjusted with the wing flying as level as possible. It is the banking that brings about the downfall. You can experiment with very small dihedral and rudder so that skidding turns could be obtained, or use a flexible stabilizer. The problem is now clear; reduce lift during the high power launch, and bring it back to regular glide angle after the model reaches the top.

You can see why the glider can make only one certain size circle. If you try to tighten it, it will spin in. Fiddling with adjustments will only give you hairline stability which may pop the wrong way in a thermal. The best cure is to find and be satisfied with a bit larger circle.

Construction Hints. A great deal of flight performance will depend on the balsa used. Lightness, of course, is important, but strength should not be sacrificed Stress loads during the hand-launching period are very high. Of course, it differs from one man to another.

All stock should be quarter-grained. Other grains tend to produce warps after the model is made, and especially under damp conditions.

Airfoil shape is important. Not so much as to lifting qualities as to the importance of having a uniform surface, and so reduce drag to a minimum Lift and drag determine how long the model is going to stay up. If you increase lift and reduce drag, you are doing the right thing.

While assembling the glider, be liberal with the cement. Not only at the junction point but for a distance away from it to form a cement skin. The major launching load is at the root. By having a cement skin extend about an 1" from the center, you form a socket-like construction for the wing, and transfer pinpoint loads over much greater area. This same reasoning applies to tip dihedral joints. In fact, if you want to be sure, use bandage over the joints. This may be especially desirable if you are just starting gliders.

Finishing. The balsa surface definitely needs some sort of a finish Without a finish, the balsa will be subjected to all atmosphere changes. On a damp day, balsa will actually rise in spots Another fact is that "fuzz" must be removed or "plastered" to the wing The finishing will depend on how much extra weight can be used for finishing

On indoor gliders, the finish should be light. One way of doing it is to run a stream of castor-oil-treated dope along the span, and then spread it with fingers as much as possible. Keep on rubbing with fingers until the dope dries up. In this manner, the solution is forced into the pores. Also, the surface remains smooth after application,

requiring very little fine sanding.

Outdoor gliders need much more protection. They must be made practically waterproof. This means several coats of treated dope with intermediate sandings.

Clipper Chisai

(*Continued from page* 49)

"(4) *Power with payload.* First test flights should be made by hand-launching over soft ground, preferably grassy. This is to reduce damage in event of power-on stalls near the ground. If the model shows this undesirable tendency, correct with downthrust (we put about 5 degrees into the test model by adding spacers back of the two top mounting bolts) or by increasing left turn (the rudder trim tab is sufficiently effective for this), or a combination of the two. The model should climb in left circles about 100 feet in diameter and glide in left circles of considerably larger diameter.

"When satisfactory flights are secured by hand launching, bring the model back to hard surface for R.O.G. Raise the tail and push; if it will roll fairly straight (or preferably with a tendency to turn right) for as much as 6 feet, take-offs will be no problem and no fudging is necessary.

"The original model was tested in solid overcast weather (no thermals) with light variable breeze and temperature about 45 degrees F. Fuel was Power Mist in the tank, but a special Japanese brand of kickaboo juice was squirted here and there into the openings just to get things started. The model is extremely stable and makes snap recovery from unusual positions; it actually did a couple of tail slides in power stalls (before we got around to the downthrust and left turn settings) with no tendency to fall off on a wing or enter a power spiral.

"The one surprise of the tests was the appetite for downthrust which the design on paper did not seem to call for. The one dangerous attitude was determined to be a steep right turn, which does bring the nose down into a power spiral headed for trouble.

"Unfortunately, we were a little stingy with tank capacity, so no data on 20-second engine run flights is available. With 15 seconds engine run, R.O.G., payload aboard, the total endurance clocked in at about 75 seconds each for a half dozen consecutive flights. *Clipper Chisai* has been lots of fun to develop, and she's even more fun to fly."

Instrument Tech

(*Continued from page* 30)

him to step up to gyroscopics. Within another 12 months, Jerry was laboring on electrical gadgets. By that time he considered himself ready to tackle any job they might hand him.

Jerry declares none of these jobs is really tough—"just read the manual." But the books don't cover everything. For example, that pesky oxygen gauge, perhaps as simple a device as any man could be asked to repair or calibrate. This device includes a Borden tube, a beryllium copper U-shaped affair closed at one end. Increasing pressure tends to straighten the tube, and the pressure is read on a dial. This particular tube was okay at 500 pounds. At 1,000 pounds true, it registered 1,300. At 2,000, it showed 2,800. It was important to know exactly how much oxygen remained in the master cylinder. Jerry checked and re-checked. At last he discovered a screw slipping ever so slightly as higher pressures were reached. A new screw and nut cured that ailment.

For most tests, of ailments involving

worse troubles than obscure slippages, Jerry turns to precision instruments that either help locate faults or check out his work. He uses a stroboscope on gyroscopes and tach mag generators. He calibrates airspeed meters in reference to manometer readings. All gyroscopics he subjects to the rolling, pitching and vibrating of a Scorsby, a machine that duplicates the ride in an airplane in rough weather. And he knows that, directly or indirectly, the CAA is looking over his shoulder. Sooner or later, if he makes a serious mistake, his error will catch him up.

Jerry doesn't hesitate to tackle new instruments. Nor does he recoil from big words. Take the VHF Navigational Receiver, made by both Bendix and Collins. This amazing instrument is now being installed by CAA. You've heard of it as the omni directional radio range, called ODR. It is designed to fulfill navigational and communication requirements of all types of aircraft.

"The receiver," Jerry read in a manual, "is a double conversion superheterodyne having a tunable first I-F of 19.5 to 21.4 mc and a second fixed I-F of 3.2 mc. Injection frequencies for the first converter are obtained from a group of 14 crystals selected by a tap switch driven by the megacycle autopositioner . . "

He hits this mouthful of words and apparatus during his second year, provided he thinks he is ready, and provided further his section chief also thinks he has become sufficiently proficient. Here he is doubling in two fields—instruments and radio. If he is a hammer and tong mechanic, he will have dropped by the wayside before now. He will get some toughies during coming months—toughies like this:

Flight 112 landed at Los Angeles International Airport not long ago to the accompaniment of a notation in the pilot's log book: "Right gyro drifts." That was all, three little words. An instrument line maintenance mechanic removed the ailing gyro. Shortly the instrument reached the instrument shop, and by routine landed gently on Jerry's bench. Now it was his double-barreled chore to find the trouble and fix same.

Did the fault come from a kinked line and resulting vacuum shortage? Jerry checked. He set the magnetic compass at 360 degrees, but the gyro swung away four degrees. No trouble with the vacuum line. What then? Rotor off balance? Experience pointed to unbalance as a probability. But some deeper cause must produce this evil.

Jerry consulted the gyro's record. Nearly 3,700 hours since overhaul. That left only 300 to go before routine overhaul. Might as well give it the works. He disassembled the unit, down to the last ball bearing. He polished all pivots, taking care not to scratch their shining surfaces. He cleaned other parts carefully. He inspected various surfaces under a magnifying glass to make certain no lint or dust remained.

During this procedure he found one end of the rotor bearing impinging ever so slightly against an outer surface. Everything cleaned, he re-assembled the instrument, working carefully but rapidly. At last he ran it up to operating speed—1,400 rpm—then shut off the power. Consulting his watch, he observed the spinning shaft. Unless it coasted 12 minutes, it wasn't ready for service. That's how freely running must be these neatly fitting assemblies. After 13 minutes, he knew the gyro was trustworthy, hung a "go" ticket on the assembly and returned it to the stock room.

Jerry's willing for the flight crews to take the credit for good performance. They bring their loads through safely, and usually on schedule. But why? Because Jerry, and others of his kind, stack those aircraft with instruments the flight crews can believe because their dials mean exactly what the inner workings tell them to say.

Air Mobilization

(*Continued from page 16*)

Scale models may be an important means of teaching aircraft recognition. During the last war, the Navy conducted a nation-wide contest in the schools to produce thousands of models for training its own personnel.

Actually, models for such purposes can be stamped out of plastic in mass quantity. As a cold matter of dollars, the laborious hand carving doesn't pay.

But there is something in the hand-carved job that doesn't come out of a mold; it's from the heart of a youngster trying to do something for his country and, in the process, learning something the nation needs its rising generation to know.

Both the making and viewing of models fixes the look of each plane on the memory. Model clubs should not wait but should get in touch with local civil defense authorities to see how they may help

Civil defense flying, though federal clearances were long delayed, has been organized in many States

The civil defense machinery has needed operators—not only volunteers but full-time supervisors hired by states, counties, and cities. As the Governors were urged early in the year to get organized by April, there should be sources of information in your vicinity.

Mobile air-ground units are now stressed by Civil Air Patrol. As many as possible will be formed in every state by this auxiliary of the Air Force

Either the local CAP Squadron or Flight may become a mobile unit or it may form one or more within its present structure Each mobile unit will be divided between air and ground personnel

Readiness for an atomic strike is a main goal. A unit prepared for that, of course, can well cope with other emergencies. It is realized that the number of lightplanes available can not carry nearly enough supplies for the complete aid of a stricken city.

But there are enough to do a big job of scouting over the ruins, taking tests for radioactivity, finding a place to land, and bringing the first doctors and medical supplies. As planes go out for more supplies, they can evacuate badly injured patients.

That is CAP's new rallying point. In addition to its own members, CAP is willing to train some non-members and thus enlarge the force it can call out in emergency

The rule still is that men and women 18 and over can join CAP as senior members; young people 15 through 17 as cadets. While there are limits as to the use of cadets in the sort of missions that be flown after enemy action, the cadets get substantially the same training as the seniors, including the opportunity to take the CAP officer candidate course

In the last war, CAP training was good for those who entered the service whatever branch they might choose. It helped many pass tests that untrained recruits failed

Civil Flight Training is a hope this year. Before the last war, the Civilian Pilot Training Program prepared many young people for the air forces.

Today, the only such program has been G.I. training, for veterans only. So only 3% of the currently valid pilot licenses in the United States are held by 'teen-agers

Recognizing that it is the young who will be most needed for military pilot training, Congress is considering bills for an airman training deal, not only for pilots but for mechanics and technicians

Another pending bill would give flight training to the Air ROTC students at 125 colleges. The Air Force intends to add 62 more colleges to the list

Month by month, the opportunities for air-minded young people are broadening in this country

AIR TRAILS Hobby Shop Directory

Model Builders! Here's a listing of the nation's leading hobby shops. You'll want to file it away—and when you're in the neighborhood, drop in and browse around. They're expecting you.

Senior "19"

(Continued from page 58)

28" and include over a dozen detail assembly sketches, flying details, a chart of flight maneuvers, etc. Another sheet of the same size constitutes a full size "two-view" drawing (a three-view isn't necessary) of the finished plane.

The instructions take up wing construction first, so we did likewise. First job is to cement the two key-lock wing main spars together. The wing tapers in both chord and thickness, so the spars were set end to end and upside down on a smooth surface while the cement dried. Incidentally, all three grades of Testors cement can be used to advantage on this plane. For most of the balsa work, the "Formula B" (fast drying) is best, except when fastening the two molded fuselage shells in place, when the slower-drying "Planking and Sheet Covering Cement" is useful. If fabric covering is used, Testor's "Formula A" (extra fast drying) comes in handy.

The ribs fit in their spar slots just like "turning a key in a lock," as the ads claim. Furthermore, they hold themselves tightly in place, as does the slotted and shaped trailing edge. When you have this much assembled, your wing is very near completion.

Tail surfaces are quickly built from sheet balsa. The usual fabric tape hinges hold elevators and stab together, and the control horn is completely formed ready to cement in place.

The molded fuselage pieces are necessarily made a little oversize, and must be trimmed at the edges for a perfect fit. This trimming should be done with care as the sides must fit over the keel and former assembly very closely in order to attain the maximum fuselage strength. The only point to watch, when fastening the first side to the keel, is to be certain the latter is not forced out of line during the process.

It helps to lay the keel-former assembly on its side over a series of equal-height blocks laid on your table. Then you can press the molded side piece down against the keel with no danger of deforming it. Addition of the second fuselage side later on in the assembly is a cinch, as the combination of keel and first side is very rigid.

The motor and nose section parts are fitted before the final fuselage half is clapped on. You will note that the plans and pictures show a metal prop spinner and it's just as well to fit one, especially to keep your ship balanced as was the original. The final balance point, incidentally, should be between the front lead-out wire and the wing spar. You can, of course, fly the ship successfully with a balance quite different from this, but if you hope to do the full stunt pattern, you'd better balance the ship properly to begin with.

A large sheet of heavy model tissue is supplied with the kit. Doping, fuel proofing, plus decal or other decorations just about finish the job. Before attempting a flight, take a final check on the balance point specified above, and correct if necessary.

We learn from Chief Engineer Bast that the 19 was the basis for original development work on the *Senior*. After the design was worked out, the 29 and 9 versions were scaled up and down as required. Some of the many test models were low wing and others had flaps. While good results were had with the latter, it was felt that unless they are perfectly installed and adjusted, the pilot—especially if inexperienced—would tend toward erratic and jerky maneuvers. The experienced builder and flyer, however, should have little trouble in adapting flaps to the *Senior* design and getting worthwhile results from them.

In addition to the undoubted novelty and usefulness of the special construction features of the *Senior* kits, the makers have produced an attractive and flyable ship as well. If carefully built, so that maximum advantage may be obtained from the strong fuselage keel and molded-side construction, the ship is surprisingly light. It must be, of course, to do those consecutive outside loops and vertical eights that have proved to be the downfall (literally) of so many ships and flyers in past contests.

It's interesting to note that of the three sizes in each class, the 19's have maintained a small but consistent lead in popularity, followed by the 29's, with the 9's last. Even so, there is only a difference of 15-20% between the extremes. Other facts and figures furnished by Nils Testor, President of Testor Chemical Company, are also of interest. It is surprising to learn, for example, that advance orders for the *Senior* kit have been greater than for any of its three predecessors, with the Junior following. However, the Freshman has shown the most steady sales month in and month out. Since it was the first of the series and was marketed over a year and a half ago, this surely indicates a continuous influx of new modelers who wish to start properly with a simple basic trainer.

A useful fact pointed out by C. D Miller, who builds the McCoy engines recommended in this program, is that the engine, prop, and fuel employed on any one of the three sizes of Freshman kits is applicable equally well to the same size kit in the other three categories. Thus, a builder who starts the series with a Freshman 19 can simply transfer his engine to the 19 size model in Sophomore, Junior and *Senior* grades.

Dope Can

(Continued from page 41)

ing it alive and active is tough. Ask any Elk Exchangite or sports club director—to name just a few. If the majority of your members are in school you've got to allow for school activities and studies taking a big chunk out of their modeling time. How about rounding up some older members to help keep things

ADVERTISERS' INDEX

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While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this May, 1951 index

moving during the winter months? Have you tried any social functions to vary the modeling diet? Any chance for a hobby section in the local papers? This will serve to publicize the club to nearby modelers.

How about some simple contests with a new twist; something like the "Two-Bit" event at M.I.T.? Do you have movies at some of your meetings? That's a good angle not to overlook. Any full-scale aircraft engineers in your vicinity who might discuss design with the boys? How about exhibitions at the Boys Club, YMCA or department stores to bring in more members? Do you have announcements posted in the hobby shops?

The A.M.A. in Washington has a club manual. Do you have a copy? How about contests with some British club? You fly the same type of model on the same day and compare results by mail. Did you ever consider visiting some other club not too far distant? How about the members—both active and inactive—have you polled them on what type of meetings and activities they enjoy most?

Club Chatter. Anybody know the proper address for the Georgia Congress Model Airplane Clubs? Mail is being returned addressed to R. H. Elliott, Box 5068, Atlanta 2, Ga. Mr. Elliott took us to task for not running more news of Congress affairs. If no one gets out the news, we can't print it . . . Making a real switch, the *Flying Bisons* of Buffalo, N. Y., noted control line club, ran off an indoor rubber meet with the result that that the U-C'ers in the organization "seem to respect the free flight element in the club a little more than they did previously." Or so says Vincent Chimera, corresponding secretary. Who won? Bud Coomer with a time of 1:38.

If your club operates in the Ninth Naval District, there are some corking good films available from the District Public Information Office, Great Lakes, Illinois (don't forget to add the U.S. Navy to the address) which range all the way from naval aviation to Army-Navy football games! . . . Paul J. Ring, remembered for his outstanding efforts at the 1947 National Meet, advises us of the Twin Cities (St. Paul & Minneapolis) meets for '51; *Wakefield Eliminations* late in April or the first part of May; the Twin City area is one of the six chosen for the Eliminations, modelers to go to Chicago. No prizes. Second annual *Talent Scout* contest for June 3rd. For boys and girls under 17. The Scout may be anyone 17 or older. Merchandise and trophies for prizes. This meet is sponsored and conducted by the Association of Twin Cities Hobby Retailers.

The 4th annual *Minnesota Plymouth Dealers'* contest will be held late in July. Trips to Detroit, trophies and cash for prizes. For more info on the preceding competitions contact Mr. Ring at 2816 E. 42nd St., Minneapolis 6, Minn. He will be the contest director. The 3rd Annual PAA-LOAD event in the T-C area will be run off on Aug. 5th. Merchandise and trophies as awards. For entry blanks on this meet contact Walt H. Billett, contest manager, 2548 Nicollet Ave., Minneapolis 4.

Wakefield Notes. The American Wakefield Committee of the AMA under the chairmanship of Ed Lidgard, South Bend, Ind., has done a fine job in shaping up the American Wakefield program this year. An appeal for funds to send a U.S. team to Finland has gone out ($5,000 is needed) and the committee which includes William Fletcher, Elmhurst, L.I. and Russ Johnson, San Gabriel, Calif., has mapped out a series of preliminary elimination and final qualification rounds that makes real sense.

The committee advises, first, that such commercially marketed devices as bobbins, propeller folding hinges, pre-formed propeller shafts, finished wheels, etc., are not allowed on '51 Wakefield entries. Specifically permitted are manufactured ball bearing thrust washers, gear wheels if a gearbox is used and commercial timer units.

Dates for the elimination meets are April 29 for the East Coast and April 22 for all other areas; semi-finals are scheduled for May 20th; and the finals, the International blue-ribbon event, goes on at Jami-Jarvi, Finland, on July 7 and 8. Russ Johnson (344 Duane Ave., San Gabriel) will supervise elimination meets in Portland, Ore., Salt Lake City, Los Angeles and Sacramento. Ed Lidgard (814 Bryan St., South Bend) will handle eliminations in Chicago, Kansas City, Mo., Dallas and Minneapolis. Bill Fletcher (8708 Grand Ave., Elmhurst) will check on eliminations in Atlanta, Norfolk-Hampton, Va., Cleveland-Akron, and New York City.

Semi-finals will result in two U.S. team members being selected at Sacramento and one each at Chicago, Dallas, Atlanta and Philadelphia. The elimination rounds will determine contestants who will compete at the semi-finals. Those selected for a semi-final competition must have averaged at least 2 minutes and placed within the top 15% at their own particular eliminations.

The committee states that eliminations and semi-finals are to be held rain or shine unless the weather report indicates really terrible conditions (winds of more than 25 mph, fog or rain). Postponement or flying under the adverse conditions is left up to the contestants; majority rules.

The Lidgard group has decreed that additional eliminations can be arranged if 15 competitors can be available for flying. These contestants' names should appear on a petition to the nearest committee member. In this manner, prospective contestants who are some distance from an already established eliminations will not be deprived of a chance to compete. The semi-finals will not be changed.

To simulate conditions found in Finland, team members must be determined in non-thermal conditions. In Finland, flying will be at night under the "midnight sun." To do this, flying will be accomplished in three 2½ to 3 hour rounds starting the first round ½ to 1 hour after official dawn. The 2nd round shall be flown immediately after the 1st. The 3rd round is to be completed ½ to 1 hour before official darkness. All flying will be on Sunday.

Processing will be accomplished the Saturday night before the contest. No processing the day of the contest. In this manner, processing will not delay flying the next morning. The place of the processing will be stated on the entry blank. If possible and if facilities are available, the models will be impounded for the night after being processed. In any event, each part of the model will be identified with a stamp, decal or stencil. Second models must be processed simultaneously with the first and will be impounded until proof of need is shown.

Order of flying will be determined by drawing a number. This drawing will take place Saturday night. The numbers will exceed the total expected contestants. Sunday morning, the list of numbers not taken will be prominently displayed and those numbers remaining will be used in numerical order in calling contestants to fly. No excuse will be valid for absence when called to fly.

An affidavit verifying (1) knowledge of the rules, (2) that the contestant is the builder of the model, (3) knowledge of the flying order, and (4) that if a place on the team is won, the contestant will take the trip to Finland (if a sponsor is available) or else announce within one week the inability to go.

Proxy flying is permitted if the builder can show good reason for not attending in person. Both the builder and the flyer must sign the affidavit which can be obtained from the Contest Director in advance.

Contest Directors will be responsible for adherence to the rules. They should provide an adequate quantity of timers who are capable of judging a proper take-off according to the rules. Adequate take-off boards will be provided. Contest Directors may compete if there is competent personnel available to oversee the contest in their absence.

Contestants may enter only one Elimination contest and, if they qualify for a Semi-Final, may enter any one of the Semi-Finals. Entry in more than one Elimination or Semi-Final will disqualify the contestant.

Markings on each part of the model will be checked when the model is weighed before each round.

You may assume from all this that for the first time in years some one has put real thought and effort into lining up proper representation for America in the finals. Even if a U.S. team cannot make the finals in person, at least the proxy-flown models should be the best of the crop. To Ed Lidgard, his committee members and all who worked on the '51 arrangements—a low bow.

The Challengers. Since another Long Island model club has termed itself the "most active club East of California," the *L.I. Gas Monkeys* organized and active since 1939 stake out claim to the title: "The oldest model club East of California consistently active without reorganizations!" (Ouch!). Under the able leadership of Ernest Ruff, veteran mentor of model aviation, the club has enjoyed an enviable reputation for furthering free-flight gas throughout the New York, Connecticut and New Jersey area. The *Gas Monkeys'* annual invitational meet is a red-letter day on many a modeler's contest calendar. Plans for the bigger and better '51 meet are already underway. Twenty active club members compete in monthly club contests from April through October for a perpetual trophy awarded to the high point man each year. Interested flyers are invited to attend any of the Tuesday night meetings which get underway at 8:30 p.m. at 140-18 169th Street, Jamaica 5, N.Y.

Far-Flung Club. Boasting members from South Dakota to Connecticut, from Ohio to Minnesota, the *Parks College* (of Aeronautical Technology of St. Louis University) *Cloud Hounds* is one of the oldest air-school model groups. Organized in March 19, 1946, during the past four years the club has been able to pass on a lot of enthusiasm to other students and the faculty. Using a room provided by the College, the *Cloud Hounds* have their own workshop and meeting place right on the campus, and since members are able to use much of the school's equipment, they seldom lack for materials or assistance.

The club is self-supporting and at the present has 13 very active members. When it first got underway most club activity was in the field of free flight models, but recently many of the student modelers have turned to U-Control with jet jobs getting lots of attention. College officials feel that this modeling experience is valuable training toward future air careers; it is pointed out that the past president of the club, Dave Williams, is now doing design work for McDonnell Aircraft Company in St. Louis.

Windsor Correction. Don Graham, corresponding secretary for the Windsor, Ontario, MAC corrects our former listing for that group. The club is no longer connected with the YMCA; instead it now meets at the Dept. of Recreation offices at Jackson Park. Nearby modelers can contact Graham at 386 Devonshire Rd.

Mail Bag. J. R. Shekleton is 17, lives in England, is mainly interested in U-Control and would like an American correspondent. Write him at 29 Colne Road, Burnley, Lancaster . . . The Society of Model Aeronautical Engineers says it is the oldest society in the world devoted to the sport and science of model aeronautics. This English organization, delegated by the Royal Aero Club, under the Federation Aeronautique Internationale, controls all national and international contests in Great Britain. Its beginnings are to be found in the Kite and Model Aeroplane Association founded in 1909, which it absorbed and superseded in 1922. The S.M.A.A. consists mainly of some 400 clubs with nearly 10,000 members, grouped into 17 semi-autonomous areas covering all parts of Great Britain. In addition, nearly 100 RAF clubs are affiliated through the Royal Air Force Model Aircraft Association. Administration of the Society is in the hands of a governing council, elected by and from the individual members, and including representatives of all areas.

Any challengers for that "oldest" title? . . . Leslie E. Steen, Jr., says the East Lansing, Mich., *Balsa Buzzards* are out of business and the new local organization is the *Lansing Model Association*, Box 32, N. Lansing Sta. . . . Richard L. Smith, 512 Broad St., Warrensburg, Mo., is looking for a Bullet crankshaft. Can anybody help him? . . . R. L. DeRoo, 73 Rochelle Ave., Philadelphia 28, Pa., wants a used Forster 99. Says the local dealers can't help him.

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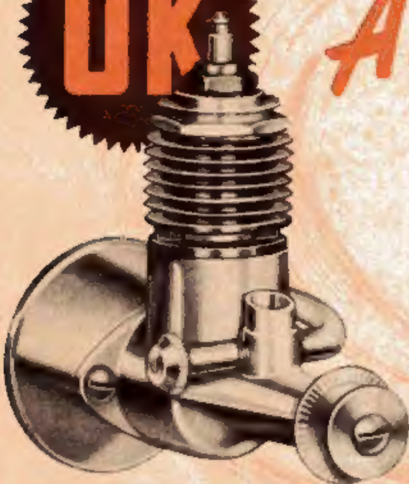

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